Vol. 195 83rd Year No. 3556

THE GAS JOURNAL

JULY 15, 1931

A Glance at the Contents—

Gas Lighting at Woodall House.

An illustrated description is published of the excellent gas lighting installation at the new Headquarters of the Tottenham and District Gas Company. [p. 150.]

A West Country Amalgamation.

Shareholders in the Weston-super-Mare Gas Light Company on July 6 approved the amalgamation of their Company with the Burnham and Highbridge Companies. [p. 147.]

Another Lighting Victory for Gas.

A striking success of gas for public lighting purposes has been achieved at Hastings which is likely to have important developments in the field of railway station lighting. [p. 145.]

Better Lighting for London's Western Exits.

Schemes for improved gas lighting along two of the main roads out of London on the western side have just been adopted by the Paddington and Chelsea Borough Councils. [p. 145.]

Semi-Direct Recovery of Ammonia.

Mr. A. L. Holton replies to the written contribution of Mr. C. S. Shapley ("JOURNAL" for June 24) on the paper, presented at the Institution Meeting, dealing with Semi-Direct Recovery of Ammonia. [p. 160.]

Effect of Steaming on Coke Production.

Mr. J. E. Blundell, of Carlisle, gives a table to demonstrate that steaming has in itself no detrimental effect on the quality of the coke from the point of view of ash content—that the steam only affects the outside of the individual piece of coke, and that the ash content of the coke gasified appears in the breeze. [p. 157.]

Dilution of Straight Coal Gas.

The system of dilution adopted by Mr. J. H. Clegg at Burnley is interesting. He produces in his horizontals a straight coal gas of 565 B.Th.U. He dilutes this to 500 B.Th.U. by the admixture of flue gases, and the resulting mixture is further diluted to 475 B.Th.U. by the addition of blue water gas, the average admission of the latter being about 10 p.ct. [p. 159.]

Intermittent Vertical Chamber Ovens.

In this issue Mr. A. H. Mills, of Portsmouth, describes the "C.O.L." vertical chamber oven installation at the Flathouse Gas-Works. The chambers have a capacity of 3·5 tons of coal per charge, and steaming is practised after a carbonizing time of 11 to 12 hours. In the guarantee test a gas of 470 B.Th.U. was made for 28 days. The gaseous yield amounted to 88 therms with a steaming period of 3½ hours (equivalent to 13 p.ct. of steam), unscreened Durham coal being used. A further 7-day test was carried out making a gas of 520 B.Th.U. with 5·2 p.ct. of steam, in which case the gaseous yield was 82 therms. [p. 152.]

New Waterless Holder at Manchester.

On Friday last a 5-million c.ft. waterless gasholder was inaugurated at the Bradford Road Station of the Manchester Corporation. [p. 148.]

This group, at the inauguration of the Manchester Holder, includes Sir William Kay and Alderman Bowes, aged 82, "Father" of the Council.

EDITORIAL NOTES

Dilution of Straight Coal Gas

WHEN the Manchester District Institution of Gas Engineers—it is still an "Institution"—meets again on Oct. 9 there ought to be a noteworthy discussion on the pros and cons of various methods of "diluting" straight coal gas (Mr. Robert Watson, by the way, prefers the word "blending;" "dilution," he thinks, might give the public a wrong idea of the process). Certainly it was an excellent idea of the President, Col. W. M. Carr, to invite communications on the subject; and between now and October there will be plenty of opportunity of studying the papers, one of which, by the President, was published in last week's "JOURNAL," and two of which, by Mr. J. E. Blundell, of Carlisle, and Mr. J. H. Clegg, of Burnley, are reproduced to-day. The others (by Mr. G. Dixon, of Lancaster, and Mr. A. L. Holton, of Manchester) will appear next week.

The President is quite right when he says that the practice, which is so common in many small gas-works, of reducing the calorific value by pulling on the retorts is to be deprecated in that it is impossible to afford the consumer the supply which he requires—gas of constant quality and gravity. Also, one must consider the damage done to refractory materials by pulling, and its general effect on working results and the life of the setting. The President's system of dilution at Stretford is an automatically controlled admixture of producer gas generated in self-contained units. The maximum quantity of producer gas necessary for dilution does not exceed 15 p.ct. by volume of the straight coal gas, and the average inert content of the mixed town gas (500 B.Th.U.) over twelve months is under 12 p.ct. Col. Carr puts forward as the particular advantages of the use of producer gas from producers utilized for the heating of the settings the low capital cost of the installation, the saving in labour, and the infinitesimal cost of repairs and maintenance. "The expenditure involved," he states, "is very small, and permits of the adoption of the system in the smallest gas-works. In making this claim, I would point out that the automatic control is a refinement which could be dispensed with in small installations, as, for three years, the admixture of the producer gas at Stretford has been effected by hand control of the producer gas governor to maintain a variation of not more than 2 p.ct. in the declared calorific value." This is interesting in view of Mr. Holton's comment that in the larger works, where technical supervision is constantly available, the necessity for an automatic device is not so pronounced as it is in the smaller works.

The plant for the production of the ideal diluent, maintains Mr. Holton, must be easy to control, and be capable of meeting irregular demands, while the gas produced must have constant calorific value and specific gravity; and he claims that the Trefois producer fulfils these requirements. This type of plant produces gas of a steady quality, is capable of meeting immediately demands which may fluctuate within wide limits, and there is no need to provide a holder. The cost of the producer gas therm at Manchester is 1d., with breeze at 5s. a ton, while Col. Carr gives a figure of 1·36d. (coke at 20s. a ton) for Stretford.

The system of dilution adopted by Mr. Clegg at Burnley is unusual. He produces in his horizontals a straight coal gas of 565 B.Th.U. He dilutes this to 500 B.Th.U. by the admixture of flue gases, and the resulting mixture is further diluted to 475 B.Th.U. by the addition of blue water gas, the average admission of the latter being about 10 p.ct. The cost of the water gas therm at Burnley is 2·13d. Mr. Clegg, who is of the opinion that the calorific value of gas which should be distributed should closely approach the highest value which can be the most economically and at the same time consistently produced, points out that, to distribute (say) 20 p.ct. more value to perform the service required by the consumer, can only be justified if the saving in cost of production outweighs the increased standing and maintenance charges which arise in consequence of the larger mains, services, and meters which ought to be provided, and upon the increased capacity required of works subsidiary plant. These charges are not easily assessed, and in many cases are not directly noticeable, because the plant and distribution system may have been laid in the first instance with a wise provision for increased demands. "I am afraid," he says, "these losses are often ignored in the desire to produce large thermal yields in carbonization." The only comment we have to make on Mr. Clegg's method of dilution is that the final gas contains more than 20 p.ct. of inerts.

Steaming in Verticals

THIS matter of inerts is taken up strongly by Mr. Blundell, of Carlisle, who leaves no one in doubt as to what he considers the best method of diluting straight coal gas. This is steaming in continuous vertical retorts, and in particular in the Glover-West system. His observations in this respect are of both interest and importance. It is an established fact, he remarks, that, given proper facilities for heating the retorts, successive increases in the proportion of steam admitted at the base will result in the addition of gas of a calorific value which can be very safely estimated at 300 B.Th.U. per c.ft. Further, given the yield of gas per ton at any one calorific value, the yield to be expected at any other, within reasonable limits, can be calculated. And as to the thermal efficiency, he emphasizes that for any good standard gas coal the combined efficiency of the two processes will be proportional to 70 p.ct. in the case of a mixture of straight coal gas with blue water gas generated in separate plant, as against 85 p.ct. in the continuous vertical retort in which a gas of about 450 B.Th.U. calorific value is manufactured in the single process with steaming. Moreover, at Carlisle, the inerts in the gas supplied do not exceed 10 p.ct.

Mr. Blundell gives a table to demonstrate that steaming has in itself no detrimental effect on the quality of the coke from the point of view of ash content—that the steam only affects the outside of the individual piece of coke, and that the ash content of the coke gasified appears in the breeze. Summing-up, the author says: "No one disputes now that we have succeeded by this means [*i.e.*, steaming in continuous verticals] in obtaining additional and very valuable therms per ton out of all proportion to the expenditure of coke, and without any detriment to the quality of the coke. On the other hand, the fears that steaming would in some way damage the refractories of which the retorts are constructed have proved unfounded. The life of retorts, now that steaming is practised, is not less than it was before that practice was adopted. On the other hand, the volume of gas made per retort during its life has been considerably increased. There is no doubt whatever that the continuous vertical retort, operated in conjunction with the process of steaming, has given to the gas engineer an instrument of greater efficiency than he ever possessed before."

The remaining paper is by Mr. Dixon, of Lancaster, who deals with dilution by steaming in intermittent chamber ovens. The ovens at Lancaster make a straight coal gas of 550 B.Th.U., and this is reduced by steaming to 500 B.Th.U. The low percentage of inerts in the final gas is noteworthy, and Mr. Dixon states that no difficulty has at any time been experienced in maintaining a straight-line diagram on the town supply. The author rightly maintains that it is impossible to assess the relative merits of different methods of dilution without reference to the type of plant, conditions of labour, local

market for coke and tar, wear and tear upon plant, quality and quantity of residuals, &c., each of which has a direct bearing upon the method of dilution to be decided upon.

We look forward keenly to the discussion of these papers in October next.

Intermittent Vertical Chamber Ovens

In this issue Mr. A. H. Mills, of Portsmouth, describes the "C.O.L." vertical chamber oven installation at the Flathouse Gas-Works, which appears to be a very sound carbonizing unit from many points of view. Indeed, vertical chamber ovens generally fully deserve the popularity which they are gaining among gas engineers. In the particular plant at Flathouse the chambers have a capacity of 3·5 tons of coal per charge, and steaming is practised after a carbonizing time of 11 to 12 hours. In the guarantee test, to which we call the attention of our readers, a gas of 470 B.Th.U. was made for 28 days. The gaseous yield amounted to 88 therms with a steaming period of 3½ hours (equivalent to 13 p.ct. of steam), unscreened Durham coal being used. A further 7-day test was carried out making a gas of 520 B.Th.U. with 5·2 p.ct. of steam, in which case the gaseous yield was 82 therms.

Especially noteworthy in both these tests were the combustion chamber temperatures, which averaged 1300° C. at the base and 1000° at the top; and these temperatures "were easily maintained practically constant." To summarize the results, which will be of value to our readers, the capacities of the plant were 105 and 115 tons of coal per diem at 470 and 520 B.Th.U. calorific value of gas made respectively, and the fuel consumption averaged 14·9 lbs. of carbon per 100 lbs. of coal charged to chambers. It is remarkable, states Mr. Mills, that the changing of the periods of carbonization and steaming for the different tests required practically no alteration in the heating arrangements of the plant. The coke available for sale, reduced to a 5 p.ct. moisture basis, was 10·7 cwt. per ton during the guarantee test and 11·5 cwt. during the tests under reduced steaming conditions. The Flathouse plant is complete with waste heat recovery, and producer gas is generated externally. There are four external producers, any three of which are capable of supplying sufficient gas for the running of the plant. The installation was put into operation last November, and its further working will be watched with interest.

British Mining in Retrospect

Is British mining to be afflicted with perpetual unsettlement? This question may well be asked consequent on a glance over its post-war record, with its six weeks' strike in 1921, six months' stoppage in 1926, spaces between besprinkled with sectional disputes, innumerable negotiations, and culminating crises which at an "eleventh hour" have subsided to a "peace" with little assurance of endurance. From 1926 to 1929 there was surface contentment by comparison with all that had gone before; but it was an aftermath of exhaustion, there being no strength left for a further kick on either side. By that time statisticians were able to demonstrate that since the twentieth century opened enough money had been wasted in British mining disputes to buy up the whole of the pits, lock, stock, and barrel. It was thought by keen observers in 1928 that at long last the owners and miners had realized the futility of seeking betterment by beggaring the other side, a conclusion deriving support by subsequent attempts to repair the ravages of a disastrous stoppage in quiescent atmosphere.

Politics played no small part in mining controversies from 1918 to 1926. There was a comparative lull up to 1929, but from the advent of a Labour Government to the present day the political octopus has had the industry more firmly in its grip than at any previous period. This is no place for displaying political preferences; we are merely stating cold historical facts. No one can gainsay that the deeper the political wedge has been driven into the coal face, the more certainly has British mining lost the capacity for self-help in restoring its commercial integrity. We need go no further back than the last two and a half years to punctuate that truism.

During the 1929 election promises were made to the Miners' Federation which had no relation to mining economics, and have proved totally incapable of realization. The dire financial state of the industry has taught that an increase in costs of production will only accentuate the adversity with which the industry is struggling. The 1926 stoppage gave Poland a firm grip upon the Scandinavian markets, of which self-imposed subsidies and all the arts of merchanting, "friendly" interchange of visits, with foreign buyers, &c., by British coalowners have failed to dispossess her. All expedients have failed to win back these markets, the loss of which has coincided with a world-wide trade depression that has seriously affected the demand for coal overseas generally. On top of this has come the increased resort to oil in ships—naval and mercantile. A recent appeal to the Admiralty to come back to coal in place of oil has met with the cold douche of "nothing doing." This is but an incomplete tabloid of the circumstances, which, aggregated, say as plain as can be said that coal costs can only be increased at the nation's peril, and to the increasing jeopardy of the industry immediately concerned. To the foregoing may be added that, in 1929, 60,266,000 tons of coal were exported, that in 1930 that quantity diminished by about 5,000,000 tons, and that this year there will be a further big shrinkage (the drop on 1930 in the first six months of 1931 is 7¼ million tons); also, that wages alone account for two-thirds of the total cost of coal at the pit-head.

From 1929 Onwards

From the incoming of the present Government the Miners' Federation set about the task of getting the ill-fated promise of reduced mining hours converted into legislative enactment. There was a hard row to hoe, for, though the Government was in office, it was not in power. Coal and coal mining were the chief topics within the legislative arena until the Coal Mines Act of 1930 was made possible by two main contributors. The chief was the inexpediency from several aspects of forcing another general election; the other was the securing of the support of the members of the Central Collieries Commercial Association, a band of owners who were reputed to produce between them 100 million tons of coal per annum, and who had a fervent belief that, if Britain could speak in the Council of coal-producing nations with a single voice, it could force the substitution of international agreements for the costly procedure of meeting a cut in price by foreign competitors with one off their own bat. Subsidies wrung from the price paid by home consumers were applied to reducing the price of export coal, but proved only of transient benefit. Moreover, even the owners in the Midlands area were not all in the scheme, while Durham and Northumberland complained bitterly that the traffic increase through the Humber ports was largely secured at the cost of reduced shipments from the ports higher up the coast. The "alliance" between the Government and the C.C.C.A. produced an Act in which machinery for regulating mining hours was sandwiched between other statutory provisions. Though the "hours" question was the "father" of the Act, it was made to look like a more distant relative by following Part I., which regulates the production, supply, and sale of coal, and Part II., which provides for reorganization of the coal mining industry.

As a matter of fact, mining hours only account for a single clause in the 1930 Act, out of the total 19 clauses. The Act took effect, according to its several provisions, at various dates, with all features supposed to be in full swing from Jan. 1, 1931. It is fresh in memory that, in starting work as a recruit to British mining, the Act had rough handling. There was a stoppage in South

Wales, and other stoppages escaped only by a hair's breadth. The Act satisfied neither owners nor miners, taking them as a concrete whole, though probably the least displeased were those owners (the C.C.C.A.) who found their own tentative efforts at price and production control more firmly stabilized by statutory enforcement. Already we have seen that the machinery for regulation broke down rather badly in the early months of the year, proving altogether too inflexible for the sudden advent of severely cold weather. In this regard, the Midland producers, singular to record, were the most heavily penalized by the quota given to them by the Central Council, and were the most vociferous complainers.

The Present Situation

ONE of the gravest faults of the Coal Mines Act of 1930 is its failure to provide for the automatic cessation of the Eight Hours Act of 1926, which, fixed for five years, was due to end on July 8, 1931. Even though those who most desired the 1930 Act equally with those who resisted it knew that this demise of the 1926 Act loomed in the offing, all were singularly slow to set about providing for the contingency. By that Act, unless other provisions were made, mining hours would automatically revert to a maximum of seven hours per day, which everybody knew was totally impracticable of realization in the present state of the industry. The 1930 Act had stipulated a maximum of 7½ hours, but even that provision had to go by the board in certain districts, notably Scotland, where a spread-over was substituted which enabled work beyond 7½ hours to be done, though not exceeding that figure as an average over a full fortnight. With the usual characteristic of mining matters, those concerned, including the Government, about two months ago awakened to the fact that something *must* be done to destroy the statutory " skeleton " which was already shaking its bones. Even then the stride was sluggish, and only within the last few weeks did energy comparable to the emergency assert itself. The goings to and fro between the Government, owners, and miners grew in number and acceleration, until in the last few days the three negotiators were almost continuously cheek by jowl with each other. Even then, mutual agreement eluded capture, and it was left for the Government to bring into being another Act, which was actually engaging the attention of Parliament as a Bill within a few hours of the closing down of the 1926 Act.

The owners have already declared that they will resist the Act as far as lies in their power. Before it took material shape they had made an offer to meet periodically representatives of the Miners' Federation to discuss economic questions, providing terms could be mutually agreed which would form the basis of fresh legislation. As the Act did not meet their views as to the right form of succession to the 1926 Act, they then withdrew the offer. The big stumbling-block to agreement was the insistence of the Miners' Federation upon the creation of machinery which would enable wages and hours to be settled on a national basis. From their past experiences of national settlements, the owners have sternly set their face against return to them. The conditions in the various districts differ so greatly as to make the task of fixing equitable settlements on a national basis well-nigh insuperable. As a Bill, the Act passed through Parliament with little resistance. All parties realized that something had to be done, and that quickly, in order to get the bogey of a seven-hours' day out of the way.

The Prospect

THE Act cuts sharply against the spread-over arrangement under which miners in Scotland have operated since the 1930 Act came into force. It is openly declared there that the 1931 Act will be set at defiance. Most other districts have accepted the Act with phlegm, which does not mean that no trouble will ensue consequent upon it; that is yet to be settled. The greatest hope that there will be no stoppages, or, if any, only of negligible dimensions, lies in the fact that the Act is only for one year. It is in effect a platform upon which the terms of a more enduring settlement may be debated. If it is accepted in that sense, the major parties concerned should forthwith continue their negotiations, preferably leaving the Government out of it altogether. There has already been too much political interference with coal mining.

What are the prospects for coal prices? Acts of Parliament and those interested either as employers or employed in the mining industry may propose this or that regulation, but under present conditions of national and international stress it is mainly economic conditions that will dispose. The times are not propitious for raising coal prices. In his address to the Waverley Association, Mr. J. D. Smith said: " It still remains doubtful whether, under the quota system and the new marketing systems generally, the Gas Industry will not have to pay more for coal, and we still have hopes that the relations between owners and miners are such as to ensure a continuity of supply." As to the price question, we cannot see any material increase being successfully applied so long as the industrial cloud of depression hangs over the trade of the country. In regard to the relations between owners and miners, we are happy to think that the hard row of adversity has taught them by this time that in themselves lies their surest hope of salvation, and only by mutual endeavour will they most quickly get back to prosperity. Parliament may help a little, but as a directional force it is a slender reed to lean upon. We certainly do not expect any serious stoppages, for to the nation in its present state of overseas trade they would be calamitous, and as a means of bettering the mining industry, or the earnings of miners, foredoomed to failure. Let the mining industry, owners and men alike, adopt the slogans, " Self-Help " and " Co-operation," and the end of their troubles will be the nearer.

PERSONAL

When the Clitheroe Corporation re-organized their Gas Undertaking they allowed their Manager, Mr. R. BARRETT, to carry through the scheme under his personal supervision. The Council have already placed on record their high appreciation of his services. To show their gratitude in more tangible form, they have decided to grant him an honorarium of £200.

The Directors of the Berkeley Gas Company (Gloucestershire) have presented a cheque to Mrs. E. MOSS, who has retired after having been Secretary to the Company for 40 years. Mrs. Moss is the daughter of the late Mr. Nathaniel Moffat, who opened the Berkeley Gas Undertaking in 1854. She is succeeded in the position of Secretary by Mr. VICTOR F. SPENCE.

Forthcoming Engagements.

[*Secretaries of Gas and Kindred Organizations are asked to assist in making this diary of events as complete and useful as possible by sending the earliest intimation of all meetings.*]

July 16.—S.B.G.I.—Meeting of Council in the afternoon.

July 17.—B.C.G.A.—Annual Meeting of Chairman and Secretaries of Gas Salesmen's Circles, 28, Grosvenor Gardens, S.W. 1.

July 21.—INSTITUTION OF GAS ENGINEERS.—Joint Research Committee of the Institution and Leeds University at 10 a.m.

July 22.—INSTITUTION OF GAS ENGINEERS.—Liquor Effluents and Ammonia Sub-Committee in the morning and General Research Committee after lunch.

Sept. 10.—NORTH BRITISH ASSOCIATION OF GAS MANAGERS.—Annual Meeting in Rothesay.

Sept. 16.—BRITISH COMMERCIAL GAS ASSOCIATION.—Meeting of General Committee at 28, Grosvenor Gardens, S.W. 1.

Sept. 28-30.—BRITISH COMMERCIAL GAS ASSOCIATION.—Annual Conference at Exeter.

Oct. 9.—NORTH OF ENGLAND ASSOCIATION.

Oct. 27-28.—INSTITUTION OF GAS ENGINEERS.—Autumnal Research Meeting.

THE NEWS OF THE WEEK

A Reduction in the Price of Gas to consumers within the town of Lurgan from Oct. 1 next from 5s. to 4s. 6d. per 1000 c.ft. and a rebate amounting to 15 p.ct. on the price of gas for town lighting have been decided upon by the Lurgan Town Council.

The Ninetieth Birthday of "Punch" is being celebrated to-day by the issue of a special double number, with a charming cover design by Frank Reynolds showing the presentation of a birthday gift to Mr. Punch—surely the most youthful of all nonagenarians!—by his grandchildren.

A Further Application has been received from the Dudley Gas Company seeking permission to instal gas lighting in a number of Council houses on the Priory Estate, but the Corporation Housing Committee decided that it could not grant the application in respect of houses where electricity is already in use.

The Employees of the Bristol Gas Company have had their annual outing to Weymouth, and they spent a most enjoyable twelve hours at this popular seaside resort. The employees numbered about 600, but special facilities were offered for their friends to accompany them, and the party numbered altogether 2000, who were accommodated in two special trains.

Included in the Twenty-Five Vehicles taking part in the French national fuel reliability trial which commenced in Paris on July 5 is a motor coach, the engine of which is being run on compressed town gas. The competing vehicles are travelling from Paris to Nice and back, and at Lyons a demonstration of the use of compressed town gas is to be made, for which the Automobile Club of France is furnishing a mobile compressor plant.

Sixteen Veterans of the Gas Industry, who have spent a total of 490 years producing heat and light for dwellers in South London, retire this week on life pensions. The men, who are retiring under the co-partnership scheme of the South Metropolitan Gas Company, are drawn from many different branches of the Undertaking. They include clerks, watchmen, fitters, labourers, inspectors, drivers, and foremen. The combined ages of the men amount to 995 years.

Five Thousand Members of the Dudley Co-Operative Society visited Hereford last week, journeying from Dudley by 160 motor 'buses. Huge luncheon marquees had been erected for the gigantic task of feeding the 5000. All the cooking was done by gas, 300 yards of main having been laid down for the supply. It was estimated that over a ton of meat and a similar quantity of salmon passed through the gas cookers. On all sides there were expressions of appreciation of the cooking—a tribute to gas.

Two Racing Balloons of 35,000 c.ft. capacity each recently served as gas storage tanks during an emergency in Ravenna, Ohio. The Gas Company was changing over from old to new lines and found it necessary to shut off the pipe lines until the switch had been completed; so the balloons were inflated to capacity with gas directly from the main gas lines by means of pipes laid in the form of the letter "Y." After the balloons had been filled and the controlling valves on the gas lines closed, one of the big bags was connected with a portable compressor which transferred the gas directly into the new lines and into the consumers' homes.

A Loan of £186,000 for the erection, by the Birmingham Corporation Gas Department, of a new central fittings depôt in Lord Street has been sanctioned by the Ministry of Health. The cost of the building works is estimated at £157,580, and that of the fixtures, &c., at £28,420. The following contracts have been placed: Messrs. Maddocks & Walford, of Erdington, Birmingham, for the erection of the building; and Messrs. Rubery, Owen, & Co., of Darlaston, Staffs., for the constructional steelwork. The new premises have been designed by Messrs. Ewen Harper, Bro., & Co., F.R.I.B.A., architects, of Corporation Street, Birmingham.

The Brechin Gas Company, Ltd., have submitted their annual report showing an increase of over 1 million c.ft. for the year ended June 30. After allowing for depreciation, interest on debentures, and adding to the contingency fund, &c., there remains at the credit of the profit and loss account a balance of £2398, out of which the Directors recommend payment of a dividend on the ordinary shares at the rate of 2s. 6d. per share and a bonus of 6d. per share. The Company also intimate a reduction of 1d. per 1000 c.ft. which will make the price 4s. 2d., which is also subject to special discounts.

Gas Lighting in Liverpool is referred to in the annual report of the City Lighting Engineer for the year ended March 31 last. In the course of this report it is stated that 0·8 mile of streets has been improved by fixing 28 4-light lamps in lieu of the same number of 2-light lamps, and 22 miles of streets have been improved by fixing 705 2-light lamps in lieu of a corresponding number of 1-light lamps. The price of gas for street lighting is 7·4d. per therm less 20 p.ct. or 2s. 4·12d. net per 1000 c.ft., when the consumption is 850,000 therms and upwards per annum. During the past year the consumption amounted to 943,658 therms as against 911,990 in the previous year.

Better Lighting for London's Western Exits.

Two More Councils Adopt High-Pressure Gas Lamps.

Schemes for improved lighting along two of the main roads out of London on the Western side have just been adopted by the Paddington and Chelsea Borough Councils.

In Paddington, along part of the Bayswater Road, centrally-hung, high-pressure gas lamps are to be installed.

The Chelsea Borough Council has decided to erect, in King's Road, about sixty 800 candle-power gas lamps. Plans have been made for a similar improvement on the south side of Fulham Road, but the execution of the plans has been postponed until a decision has been reached by the Kensington Borough Council with regard to the north side of the road.

Gas Succeeds at Hastings.

Selected for Lighting the New Railway Station.

A striking success of gas for public lighting purposes has been achieved at Hastings which is likely to have important developments in the field of railway station lighting. It will undoubtedly indicate to directors of railways that, considered on its merits from a financial viewpoint, and from that of efficiency, gas is better than electricity for the lighting of railway stations, both passenger and goods.

On July 6 the new railway station at Hastings, belonging to the Southern Railway, re-constructed at a cost of £200,000, was officially opened by the Mayoress, Mrs. G. H. Omerod, in the presence of the Chairman of the Company, Brig.-Gen. the Hon. Everard Baring, C.V.O., C.B.E., the Rt. Hon. Sir Evelyn Cecil, Director, Sir H. Walker, General Manager of the Company, and other officials.

The artificial lighting of the station includes several specially interesting features. The commodious booking hall, which is octagonal in shape, is lighted entirely from a large laylight in the roof, the system in that respect being the same as adopted for the House of Commons. The result is most effective and entirely satisfactory. The panes which form the laylight are of stout plate glass, so that it is possible to walk over it and thus attend to the lamps fixed immediately above. Over the lamps an ordinarily glazed sloping roof (invisible from the ground level) is built. Eight "Littleton" 3-burner lamps give the necessary illumination, and these are fitted with control switches, each working a group of four lamps. The groups are operated from a convenient point near the booking office at ground level.

Outside the ticket windows in the booking hall are small

THE NEWS—continued.

burners in the form of artistically designed brackets, which serve the double purpose of lighting the ticket hatches, and also as small signs to indicate what class of booking is being served by a particular hatch. These lamps are controlled by individual gas switches of the Horstmann type, operated from inside the ticket office, and under the control of the booking clerk, who can thus readily indicate at night-time which of the several booking windows is in use.

In the refreshment rooms decorative fittings by Messrs. Sugg of their " Unique " design are introduced, of a simple type easily cleanable, and which diffuse the light without absorbing too high a proportion of it. The use of gas for lighting was decided upon by the Directors, after careful comparison of local costs, on the ground of economy. Gas was found to be cheaper than electricity as regards illuminating value. With the devices now available for distant control, it has been possible to put in an installation possessing the conveniences generally associated with electric lighting. It may be added that the electricity undertaking is the property of the Corporation, and that the price charged for domestic lighting is 4d. per unit, and ½d. per unit for heating and cooking. Gas (Hastings and St. Leonards Gas Company, Mr. Chas. F. Botley, M.Inst.C.E., Engineer and General Manager) for domestic purposes costs 10d. per therm.

The whole installation was carried out by the Lighting, Water, and Heating Section of the Southern Railway, of which Mr. A. Cunnington is the Engineer.

Michael Faraday—Master-Chemist.

Faraday and Electricity would appear to be synonymous, and yet to gas engineers, in whose work chemistry plays such a predominant part, Faraday's chemical achievements and discoveries are of absorbing interest.

This was well elucidated by Dr. Robert L. Mond, as President of the Faraday Society, recently during the delivery of the Spiers Memorial Lecture, which he gave at the Royal Institution in Albemarle Street, London, in the very Lecture Theatre where Faraday himself assisted Sir Humphry Davy in his remarkable chemical demonstrations of epic distinction. Dr. Mond appropriately took for his subject " Michael Faraday," prefacing his remarks with an eulogy to the memory of Mr. Spiers, who was the first Secretary of the Faraday Society, and at its inception one of its most active promoters.

Faraday was invited to become Professor of Chemistry at University College, London, but feeling he would in that position have to sacrifice the freedom for research and opportunity for the enlargement of his knowledge by continued investigation, which the Royal Institution so adequately offered, he declined. He first came into contact with that Institution on the introduction of one of the members to Sir Humphry Davy's last series of lectures. Faraday took note of them, and wrote them out, and sent them to Davy entreating him at the same time to enable him to quit trade (he became a bookseller and bookbinder in London at the age of 13), which he detested, and to pursue science, which he loved. Davy acquiesced, and in due time made him his assistant. Davy held the joint office of Professor of Chemistry and Director of the Laboratory at the Royal Institution. He ultimately gave up the former to the late Professor Brame, but he insisted that Faraday should be appointed Director of the Laboratory, which was agreed to.

Dr. Mond referred to Faraday's chemical discoveries and to his researches in electro-chemistry, electrolysis, benzole, and polarized light. Faraday held that the exercises of conversation, lecturing, observation, and study led directly to the acquisition of knowledge. His principles were truth, order, justice. He it was who instituted the first lectures for young people, which have since become so recognized as a potent educative force. The preparation he made for them was, like all his work, thorough to the last degree.

In reviewing the present trend of scientific progress, brilliant as it might seem, Dr. Mond expressed the opinion that it was on the verge of a great crisis. The constantly increasing ramifications leading to greater and greater specialization, and the continually increasing demand of space, time, and money for the experimental equipment, rendered it increasingly difficult to obtain the experimental results required for the progress of scientific thought. Following tradition from the Middle Ages had emerged the migration of students, a process which by natural selection, at least permitted the great pupil to come into the orbit of the great teacher. The English Universities, by means of scholarships and fellowships, attempted to attract them—he would not say bribe—with similar object. The North American Universities attempted to solve the problem with post-graduate Universities and Research Professorships. Perhaps the medical education in England, with its system of dressers and house physicians and surgeons, had most seriously attacked the problem. They would have to provide opportunities where the young mind could develop untrammelled by any hard-and-fast system under the ægis of a wise and kind direction, and where every suitable aid to self-development and facilities for scientific research were amply provided. They would require Faraday's inspiration more in the future than they had done in the past.

The vote of thanks to the Lecturer was proposed by Sir William Bragg, F.R.S., Director of the Royal Institution, and that for the use of the Theatre by Dr. Thomas Lowry, F.R.S.

Gas in Relation to Air Purification.

Speaking at the Annual Conference of the Royal Sanitary Institute at Glasgow on Tuesday, July 7, Sir Francis Goodenough, Chairman of the British Commercial Gas Association, said:

Few people realize the enormous amount of soot that still defiles our buildings, our gardens, and, worst of all, our lungs, in our towns and cities. Perhaps fewer still realize what the extent of that defilement would be were it not for the tremendous growth of the use of gas instead of raw coal for all varieties of heat processes in our homes and factories during the past quarter of a century, and of the use of electricity as a source of power instead of the steam engine driven by raw coal. Things are not as bad as they were. The soot-fall in Glasgow 15 years ago was 450 tons per square mile per annum. To-day it is only half that amount—still vastly too much, but progress is clearly visible. Solar radiation in Westminster when I first came to London in 1888 was as low as 20 p.ct. To-day it is 50 p.ct., an improvement which, as Sir Napier Shaw has pointed out, " has coincided with an increase in the use of gas appliances, whose numbers have trebled in the last 40 years." What it would be to-day if the million and a half householders using gas for cooking all through the summer and much of the winter, suddenly all lit up coal ranges and did their cooking by raw coal, it is difficult to imagine.

The recorded diminution in soot output and increase in sunlight in our urban areas during the present century have been accompanied by a marked fall in the death-rate in our urban populations. The relation of smoke and fog to illnesses and deaths originating in the respiratory organs has, indeed, been clearly established. But not nearly enough has yet been done. Disease and death still have too much in their favour in towns as compared with the country. I could quote endless striking statistics in proof of that. Obviously then, more must be done. What should it be? Well, I should like to see a substantial reduction in rates in respect of property in which no smoke-producing fuel was used. I believe in positive encouragement of the good citizen, rather than penal prevention of the bad. I think that every municipality should give that question serious consideration. I believe also in the steady education of public opinion on this subject, and for that reason I welcome most heartily the interest the members of this influential Institute are taking in the subject.

But there is one thing that should not be done, a thing that there is at present a tendency on the part of some municipalities to do. That is, to turn the wheels of progress backwards by driving artisans to use coal instead of gas for cooking and heating. In what way, you will ask, is this being done? By insisting upon the installation in workingmen's homes of electric cooking stoves and prohibiting the use of gas.

I do not want to enter upon any controversial discussion of gas *versus* electricity. There is ample room for both in the service of the community, but electricity is not, and never, I believe, can be, the workingman's fuel. Its cost is far too high, and I am certain is bound always to be too high in a country that depends upon coal for its source of electrical energy; and to try to make the man of small income use electricity as a fuel is just to drive him, in many instances, back to the use of coal, with obvious disadvantage to the community, as well as to the individual.

In my experience, the proper course is to encourage in every practicable way the use in every workingman's home of gas and coke as the two economical smokeless fuels, and especially to concentrate on the provision of facilities for the use of gas.

Let us send our coal to the gas-works to be turned into gas and coke, and use up in our chemical works the tarry matter that combines with soot from the chimneys of homes and factories where the mediæval method of coal burning still continues.

That can most quickly be achieved by bodies such as this creating a public opinion that will make it as great an offence against manners and morals to empty the filth from fireplaces into the air of heaven, as it would be regarded

to-day to follow the barbaric practice of emptying sewage filth into our streets with a cry of "heads below."

By education and by encouragement, rather than by coercion—though that must come if ultimately necessary—I believe that we can achieve the great and pressing reform of the purification of our urban atmosphere.

A West Country Amalgamation.

Shareholders in the Weston-super-Mare Gas Light Company on July 6 approved the amalgamation of their Company with the Burnham and Highbridge Companies.

The Chairman (Mr. J. E. Norman) said he thought it might be taken as an axiom that the more widespread the business of a gas company which could be conducted with profit and success the greater was the stability of the company. The Directors were unanimous in recommending the scheme of amalgamation. It was proposed that stockholders in the Burnham and Highbridge Companies should exchange their holdings for ordinary stock of the Weston Company in such amounts that they would, in future, receive the same dividend as the maximum dividends they had received from their own Companies.

In view of the fact that their new holdings would be in stock of a Company which had a capital of £320,000, a gross revenue of £125,000 per annum, and would supply gas to a population of upwards of 50,000 people, it was evident that the development would give the Burnham and Highbridge stockholders a very important advantage in the strength and security of their investment.

The usual practice had been followed in dealing with the questions of compensations to Directors and Auditors for loss of office. Officials of the two Companies would be given compensation or employment in suitable positions, and workmen of over three years' service had either been given employment or compensation.

A Provisional Order from the Board of Trade sanctioning the agreements would be sought, and it had been considered advisable to ask for powers to supply gas to parts of Berrow, Brent Knoll, Burnham Without, and Huntspill, together with the parishes of Brean, East Brent, and Lympsham. In Burnham and Highbridge the price of gas would be reduced by a halfpenny per therm from the date of transfer, and within three years thereafter the price would be brought to not more than twopence per therm above the Weston price. This meant, in fact, a total reduction of a penny per therm within three years.

It was proposed to alter the name of the Company to the "Weston-super-Mare and District Gas Company," and Burnham and Highbridge would each be represented on the Board by a Director.

Mr. James Taylor (Engineer) explained that the total increase in their capital would be £91,587. Compensations were estimated at £7500; the cost of a high-pressure main to Burnham and Highbridge (including auxiliary plant) would be £21,500, and works alterations and contingencies were estimated to amount to £2630.

The necessary resolutions were carried unanimously.

Belfast Creosote Fuel Production.

Gas Committee go for Demonstration Run.

On the invitation of the Belfast Omnibus Company, Ltd., the members of Belfast Corporation Gas Committee and others interested in the project took part in a demonstration run round the County Down Coast in buses fitted with standard magneto ignition engines converted to burn creosote fuel manufactured by the Belfast Gas Department. The run was in every way satisfactory.

At lunch in Rostrevor Mr. J. M'Crea, M.Inst.T., Manager of the Omnibus Company, proposing the toast of "The Belfast Corporation," said that the question of the use of creosote as a substitute for petrol was first mooted about two years ago, when the line of investigation followed dealt with the mixture of petrol with creosote. Several difficulties were encountered and overcome, save one seemingly insurmountable obstacle—the starting of engines when the temperature was low. The solution had now been found, and they were achieving satisfactory results. The Company had, indeed, incurred a cost up to date of £2000 in connection with these experiments. Three buses were running daily between Belfast and Portaferry from June 4 to July 2, completing 6415 miles and using 217 gallons of petrol and 537 gallons of creosote, the miles per gallon being 8·508. The average miles per gallon on petrol was 7·286; in other words there had been an increase of 16·7 p.ct., to mention nothing of the reduced cost per mile. Experiments were still in progress, and a further number of buses were in course of conversion.

Councillor H. M'Laurin, J.P. (Chairman of the Belfast Gas Committee), and Mr. J. D. Smith, M.Inst.C.E., J.P. (Engineer, Manager, and Secretary), replied, the latter stating that research work was still being carried on in regard to the creosote; first, with a view to producing a spirit that would start an engine at cold without the assistance of petrol, and, secondly, with a view to increasing production. He felt that 500,000 gallons a year was by no means sufficient for Ulster. There were many inquiries from abroad, and one firm had written asking that the Belfast experts should take a sample of oil which they had been experimenting with and to point where they had gone wrong in their research.

Co-Partnership Festival at Wellingborough.

A pleasant function in connection with the Wellingborough Gas Light Company's Co-Partnership Scheme was revived on Thursday, July 9, when the business meeting of members was combined with an afternoon of sport and pleasure. Cricket, played on the pitch adjoining the works, was a feature of the amusements; and the fine concrete tennis courts laid down a few months ago for the use of the Company's employees were greatly appreciated, and the old pastimes of quoits and bowls found many followers.

The Chairman of the Company, Mr. J. T. Parker, presided over the tea which followed, being supported by several of the Directors. At its conclusion the Chairman remarked that there was a certain amount of business to be done, but this should be regarded as a continuation, and not an interruption, of the afternoon's pleasure, for each co-partner had just received a statement showing the amount of bonus allotted to him, and giving a very satisfactory account of the present position of the fund. The bonus was at the rate of 8¼ p.ct. on earnings, and amounted to £1425 14s.

Profit-sharing began in 1909, and the annual bonus paid in the first three years of the scheme's existence was in the neighbourhood of £250. The total amount distributed in this way was no less than £13,884 9s. 10d., of which sum £12,787 12s. 9d. had been invested in the Company's shares. In the course of years a number of participants had died or left the service of the Company, and some shares had been sold, but £9394 11s. 3d. of the bonus was still represented by shares held by or on behalf of present members. There were 105 co-partners altogether, of whom 101 were shareholders, some having considerable amounts invested in the Company in addition to shares bought from bonus.

After the election of representatives on the Co-Partnership Committee, and a cordial vote of thanks to the Chairman and Directors, games were resumed, and all those taking part seemed to share the wish, expressed by the Chairman, that it might be possible to make this an annual event.

Sweeping Reductions in the Price of Gas at Cork.

An all-round reduction in the price of gas is announced by the Cork Gas Consumers' Company for gas registered after the Midsummer quarter meter reading; and until further notice the following net charges will be made for gas supplied through ordinary meters:

For the first	20 therms per quarter, per meter . .	10·5d. per therm
For the next	40 therms per quarter, per meter, or per individual premises . . .	9·5d. ,,
For the next	240 therms per quarter, per meter, or per individual premises . . .	9·0d. ,,
For the next	900 therms per quarter, per meter, or per individual premises . . .	8·7d. ,,
For the next	1300 therms per quarter, per meter, or per individual premises . . .	8·1d. ,,
For all over	2500 therms per quarter, per meter, or per individual premises . . .	7·6d. ,,

The foregoing scale of charges is applicable only to consumers' accounts paid at the Company's offices within one month of date of furnishing, and any accounts not paid within that time will be charged at the rate of 10·5d. per therm.

SLOT METERS.

For the first	20 therms per quarter, per meter . .	11·5d. per therm
For the next	40 therms per quarter, per meter, or per individual premises . . .	10·5d. ,,
For the next	240 therms per quarter, per meter, or per individual premises . . .	10·0d. ,,

NEW WATERLESS HOLDER AT MANCHESTER

On Friday last a 5-million c.ft. Waterless Gasholder was inaugurated at the Bradford Road Station of the Manchester Corporation

Members representing the Corporation ascended the structure by aid of the lift, and thereafter many descended by the collapsible staircase to the piston, where refreshments were provided.

The gasholder has been operating under gas through other gasholders for some weeks, and it was observed that the atmosphere above the piston was quite fresh and clear. Upwards of 500,000 c.ft. was delivered into the vessel when the members were on the piston.

After descending, the Committee inspected the storage space beneath the gasholder, where already upwards of a thousand gas fires and stoves returned for re-fitting have accumulated. Large windows have been fitted in each bay, and the area is well lighted and will prove a useful appendage to the large meter and store workshop to which it is attached.

Alderman Harrison, the Chairman of the Gas Committee, requested Alderman T. Cook to turn the gas on the town, and the latter made reference to the disaster to the gasholders on the adjoining site which occurred during his tenure of office, and also to the investigations made before they decided to erect a gasholder of the waterless type.

At the luncheon which followed, Sir William Kay proposed the toast of the Chairman and congratulated him upon the completion of the wonderful gasholder seen that day at the Bradford Road Works, and upon the excellent feeling that existed between all the members of the Gas Committee. He also referred to the valuable pioneer work done by Alderman Cook when the project was mooted.

In replying, the Chairman pointed out that he found all the members anxious for the Department to continue to be as successful as in the past, and it was only by pulling together that this could be accomplished.

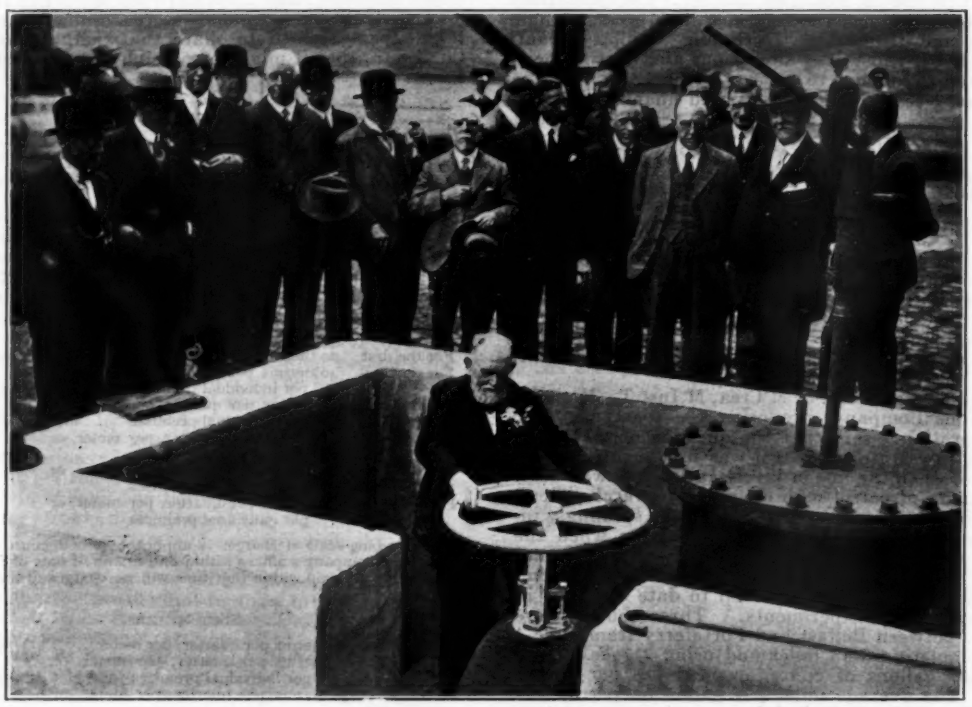
Replying to the toast of "The Bradford Road Station," the Chairman, Councillor Clapham, referred to his very capable predecessors. He recognized that the whole of the technical staff and workmen were putting their backs into their work; and in spite of the hard times they were passing through, he hoped the Gas Department would continue its successful operations.

Alderman Cook gave an interesting account of the Investigation Committee's visit to the Continent to inquire into and inspect the waterless gasholders. Although at that time some members of the Gas Committee were not altogether in favour of that type, they had since changed their views; and from the inspection of the work that day, he was sure that, if further storage were necessary, the same type would be adopted.

Alderman Bowes proposed the health of the Contractors, Messrs. R. & J. Dempster, Ltd., of Manchester, whose works were actually situated in the Division he represented. He had been acquainted with the Contractors since they took over the present works in Manchester, and after relating some interesting particulars of their early struggles and successes, he gave a survey of the new holder. He said it had a working capacity of 5 million c.ft., and from the ground had a height to the ventilator of over 270 ft., with a diameter of 176 ft., and gave a pressure of 11 in. The area covered, forming the stores, was over 2650 sq. yards, the height of the walls being 15 ft. The steelwork weighed more than 1450 tons. There were 3000 tons of concrete, 50 tons of timber covering the roof, and over a million rivets and bolts. In conclusion he referred to the many previous contracts entrusted to the firm, and coupled with the toast the name of Mr. Charles Dempster, Chairman of the Company.

Mr. Dempster, replying, said that his grandfather entered the gas business in the year 1864, and that his father and uncle—founders of the present Company—came to Manchester in 1885. To a very large extent they developed the spiral type of holder, and it was after many inspections and careful consideration of the waterless type that he and his firm concluded there was a great future for it. He said that his firm had gone to considerable expense installing at their works the special machinery requisite for the manufacture of this type of holder, and thereby made it possible for the whole of the work involved in the assembling, bending, construction, and erection to be executed by British labour and materials throughout. He pointed out that the spiral holder was the invention of Mr. W. Gadd, a Manchester man, and he hoped the same success would attend the new type. He thanked Alderman Bowes, the mover of the toast, for his kindly references to himself and the firm.

Mr. J. Winson Scott also responded briefly, and thereafter interesting information was given by Mr. J. Brown, of Messrs. Newbigging & Son, who was deputed to accompany the Committee of investigation to Germany, and also by Mr. J. Chaloner, the Technical Adviser of the Waterless Company, who has had personal contact with all the waterless gasholders erected under the British licence, as well as with the "M.A.N." type of gasholder elsewhere.



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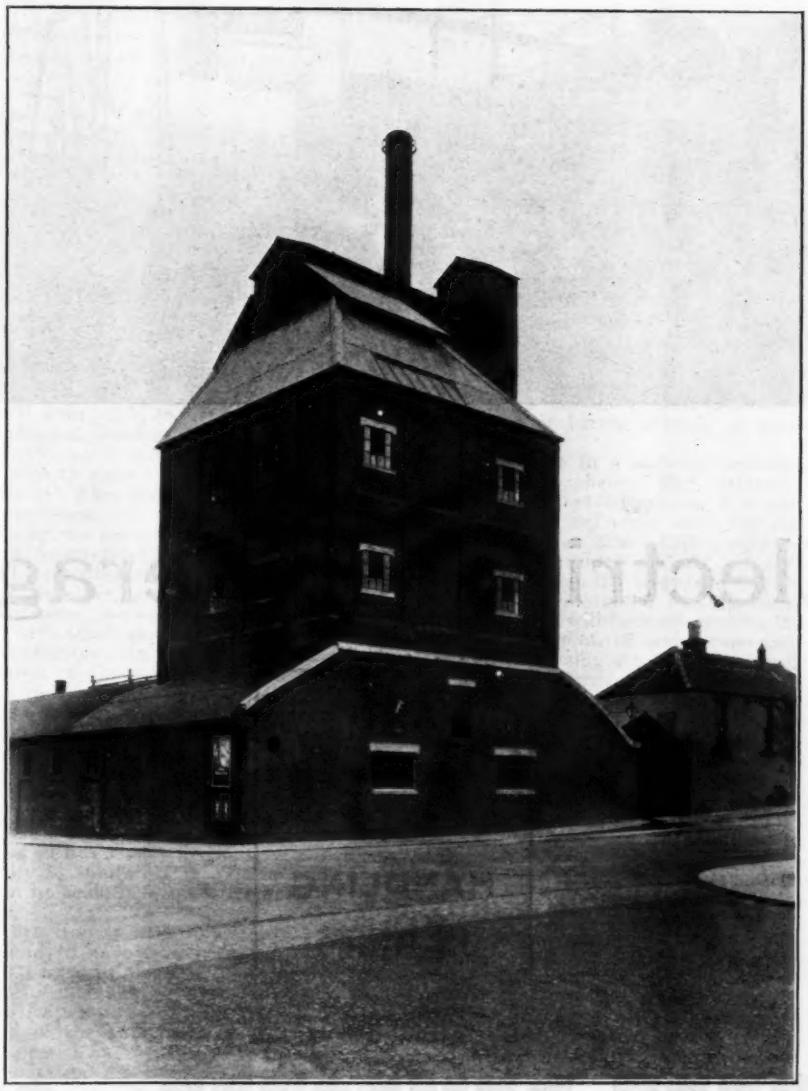
W-D

WOODALL-DUCKHAM CONTINUOUS VERTICAL RETORTS



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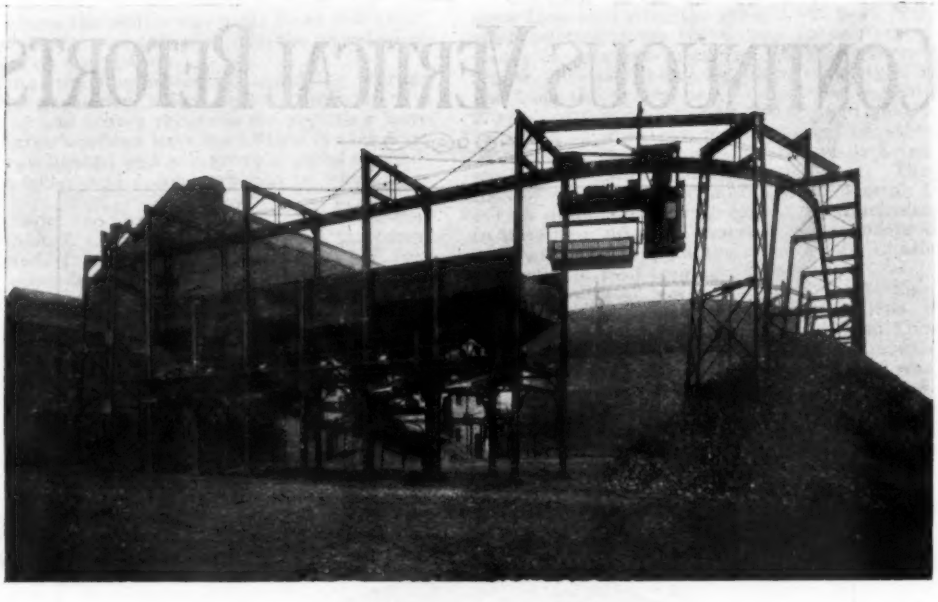

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REVIEWS

DECARBURIZATION OF STEEL AT HEAT-TREATING TEMPERATURES.*

The research upon which this Bulletin is based was initiated at the University of Michigan by the Committee on Industrial Gas Research of the American Gas Association in 1928, in the hope that a remedy might be found for the decarburization of steel in certain hardening operations in which the maximum surface hardness is required. Mr. W. E. Jominy, whose excellent work during recent years is known to many of our readers, is responsible for the Report, and he points out that this decarburization has often been the cause of excessive wear and of the early failure of parts in certain kinds of service. Parts subject to much wear, such as gears, cutting tools, &c., may be rendered worthless by decarburization, which has been encountered in every type of furnace.

The first part of the research was to study the influence on decarburization of steel of some of the gases found in the products of combustion of manufactured gas; then the effect of changes of pressure, of rate of flow of the gases, and of the atmospheres to be found in a gas-fired furnace. The gases which were studied to determine their effect on decarburization were steam, carbon dioxide, air, nitrogen, and hydrogen; the gas mixtures were carbon dioxide and steam, carbon dioxide and sulphur dioxide, and carbon dioxide, steam, and sulphuretted hydrogen.

The results of the investigation showed that, of the gases present in an open-fired gas furnace, moist hydrogen has by far the strongest decarburizing action. Decarburization was obtained with this gas at temperatures as low as 1000° Fahr. with 24 hours' heating. Since this gas is usually present when a furnace is fired with excess gas, it is probably largely responsible for the relatively greater amount of decarburization produced in an atmosphere containing excess gas. Pure, dry hydrogen is very much less active in producing decarburization than is moist hydrogen. Dry hydrogen will not produce decarburization in one hour's time at 1600° Fahr. and very little in one hour's heating at 1700° Fahr. As low as 0·1 p.ct. moisture in hydrogen will produce decided decarburization on one hour's heating at 1350° Fahr.

Next to moist hydrogen, carbon dioxide is the most serious offender in producing decarburization. Decarburization was obtained with this gas at temperatures of 1350° Fahr. and above, although when mixed with 50 p.ct. steam this action is greatly reduced.

Nitrogen, when absolutely pure, causes no decarburization, though ordinary commercial nitrogen will cause decarburization. Small percentages of oxygen or moisture in the nitrogen cause decarburization. Both or either of these impurities in nitrogen produce decided decarburization when present in such small amounts as 0·1 to 0·3 p.ct. No doubt, states, Mr. Jominy, the fact that no scale, but only a slight coloration of the sample, is formed under these conditions is a decided aid to the decarburization reaction. Steam causes a very small amount of decarburization after five hours' heating at 1450° Fahr., while air will give very little decarburization in five hours' time at 1450° Fahr.

A mixture of 42 p.ct. carbon dioxide and 58 p.ct. steam will cause decarburization after five hours' heating at 1475° Fahr. but not below this temperature. Scale formed on the outside of the steel has a very pronounced effect on decarburization, usually by inhibiting it. Decarburization is usually deeper when no scale is formed by the action of the decarburizing gas.

Variations in pressure from ½ atmosphere to 1½ atmospheres have been found to have practically no effect on decarburization. Low pressures of air or moisture, in the vicinity of 1 to 10 mm. of mercury, produce decided decarburization. However, the pressures existing in the ordinary open-fired gas furnace or the variations of pressure that might normally be expected have practically no effect on the amount of decarburization produced. The effect of the rate of flow at which the gases travel past the steel has been found to be so small as to be practically negligible.

Sulphur in the amount that might be expected in a gas-fired furnace has no effect on decarburization. The higher the temperature and the greater the time of exposure, the greater the amount of decarburization produced.

It has been found that the more strongly oxidizing the furnace atmosphere is, as measured by the percentage of free oxygen, the less is the tendency to decarburize, and, conversely, increasing the amount of excess gas in the furnace atmosphere increases the tendency to decarburize. This applies to gas-air mixtures of such proportions as might be used in any ordinary commercial heating furnace. Mixtures of gas and air as rich as one part of gas to one part of air will cause decided decarburization. Consequently, no relief from decarburization can be expected by using a relatively high ratio of gas in firing an open-fired furnace. This is precisely what is often attempted, and, of course, leads to serious decarburization. However, since scaling is usually to be minimized it is desirable to employ the least oxidizing conditions which will avoid decarburization at the temperatures used.

In addition to eliminating decarburization, it is usually necessary to minimize scaling. The elimination of decarburization and of scaling can be accomplished by heating in pure nitrogen. Ordinary tank nitrogen contains small amounts of oxygen and should be purified and kept free from water vapour if wholly satisfactory results are desired. Pure, dry hydrogen may be used for one hour's time at 1600° F., but the hydrogen must be purified with extreme care in order to eliminate small amounts of water vapour or oxygen. The use of these gases, however, requires a muffle furnace. There are many heating operations in which the temperature and time of heating are such that no decarburization and minimized scaling may be expected in a gas-fired furnace of the semi-muffle type.

To determine under what conditions no trouble from decarburization may be expected, a large number of tests were made under the various conditions that might exist in a gas-fired furnace; and the report gives a most useful table relating to a plain eutectoid steel which would ordinarily be hardened at 1425° Fahr. From this table it is apparent that this steel in the usual sizes could be hardened in the ordinary gas-fired furnace without danger of decarburization. The table also demonstrates that operations in which the steel is heated to 1500° Fahr. or above require careful control of conditions if decarburization is to be avoided.

Three main methods of minimizing or eliminating decarburization have been found. Whether the decarburization is minimized or completely eliminated depends upon the time and temperature of heating, it being much more difficult to eliminate decarburization at the higher temperatures or longer periods of heating. These methods are:

(*a*) Heating in a so-called neutral or slightly oxidizing furnace atmosphere. For instance, with an atmosphere containing 4 p.ct. of oxygen, it is possible to heat ordinary plain carbon eutectoid steel for one hour at as high a temperature as 1550° Fahr., whereas, with the ordinary furnace atmosphere (2 p.ct. of carbon monoxide), it is possible to heat the steel only ten minutes if decarburization is to be eliminated. In the neutral or oxidizing atmospheres there will be more scaling than in the atmosphere containing 2 p.ct. of carbon monoxide. In cases where a strongly oxidizing atmosphere is desired it is uneconomical to fire a gas furnace with the large excess of air. If the ordinary batch type of furnace is used, it can be run neutral or with a slight excess of carbon monoxide until the temperature of the work reaches 1425° Fahr., and then the valve setting may be changed to give an excess of air for the remainder of the heat.

If a continuous type of furnace is used, it may be fired with excess air at the hot end so that, when the steel reaches the temperature at which it will decarburize, it will be in an atmosphere containing excess air.

(*b*) In case the steel has been carburized, it will help to minimize softness from decarburization if the steel is given a slightly hypereutectoid case.

(*c*) Formation of certain types of scale on the surface will prevent decarburization. It was found that quenching from 1500° Fahr. in water after brief heating prevented further decarburization when heated in an ordinary furnace atmosphere (2 p.ct. of carbon monoxide) for two hours at 1475° Fahr. Without such a treatment, decarburization was produced at this temperature and in the same furnace atmosphere in 30 minutes' time.

Investigation of steels other than the eutectoid steel which was used as a standard in all of the previous tests showed that some steels are much more susceptible to decarburization than others.

The Bulletin is a most important one; and we are sure that it will be widely studied in Great Britain as well as in the United States of America. Great praise is due to Mr. Jominy for another excellent piece of investigational work.

* "The Surface Decarburization of Steel at Heat-Treating Temperatures," by W. E. Jominy. Department of Engineering Research, University of Michigan, Engineering Research Bulletin No. 18; price $1.00.

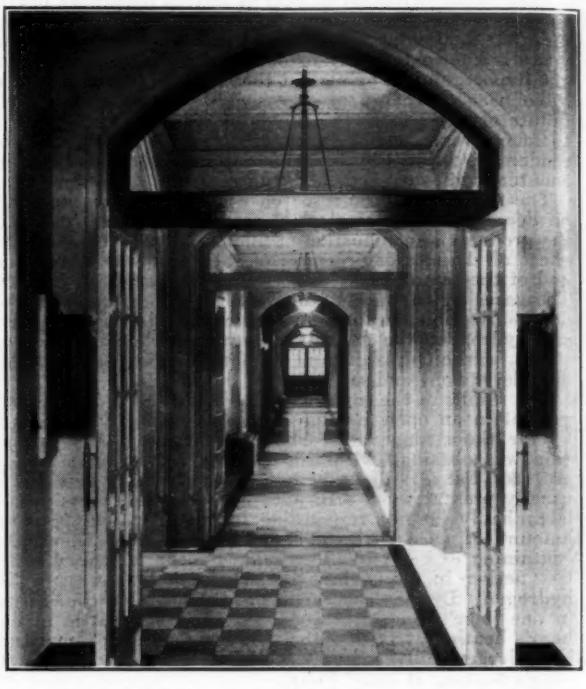
"DOMESTIC GAS APPLIANCES."

In our review last week of Mr. A. M. Apmann's book, "Domestic Gas Appliances," we made a mistake in the price of the volume, which is $2.50, *not* $4 as stated.

GAS LIGHTING AT WOODALL HOUSE

When the Southern Association of Gas Engineers and Managers visited Woodall House ("JOURNAL" for May 20), great admiration was expressed of the excellent gas lighting. We are now able to give an account of this modern installation

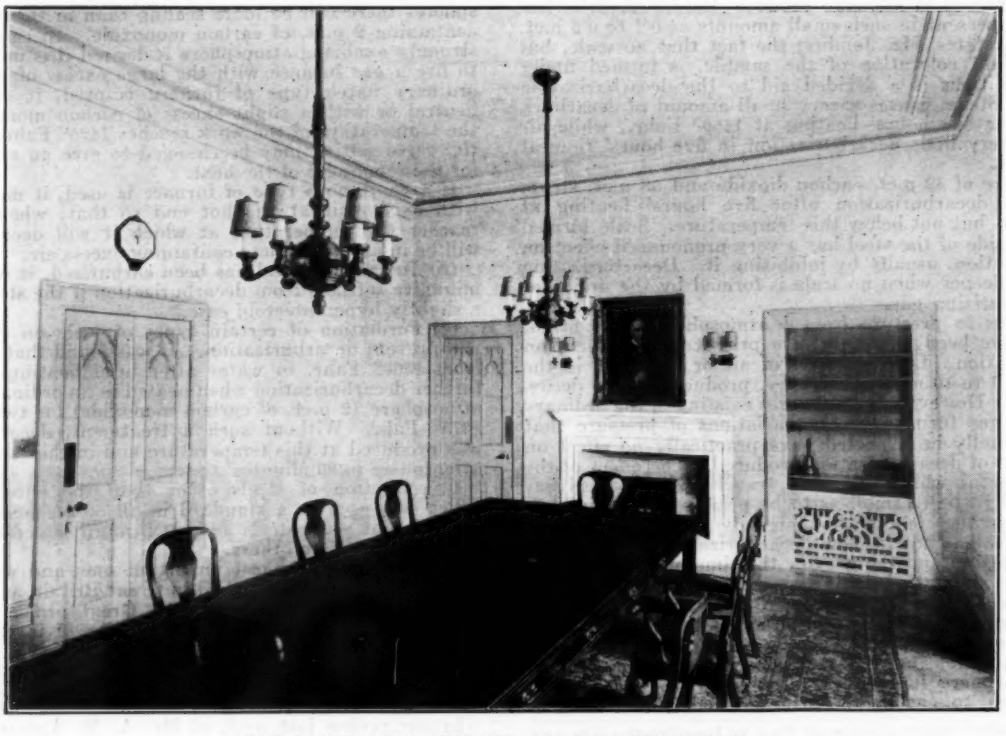
Entrance to Woodall House, showing the two specially designed 6-Burner Lamps controlled by Horstmann Switches.



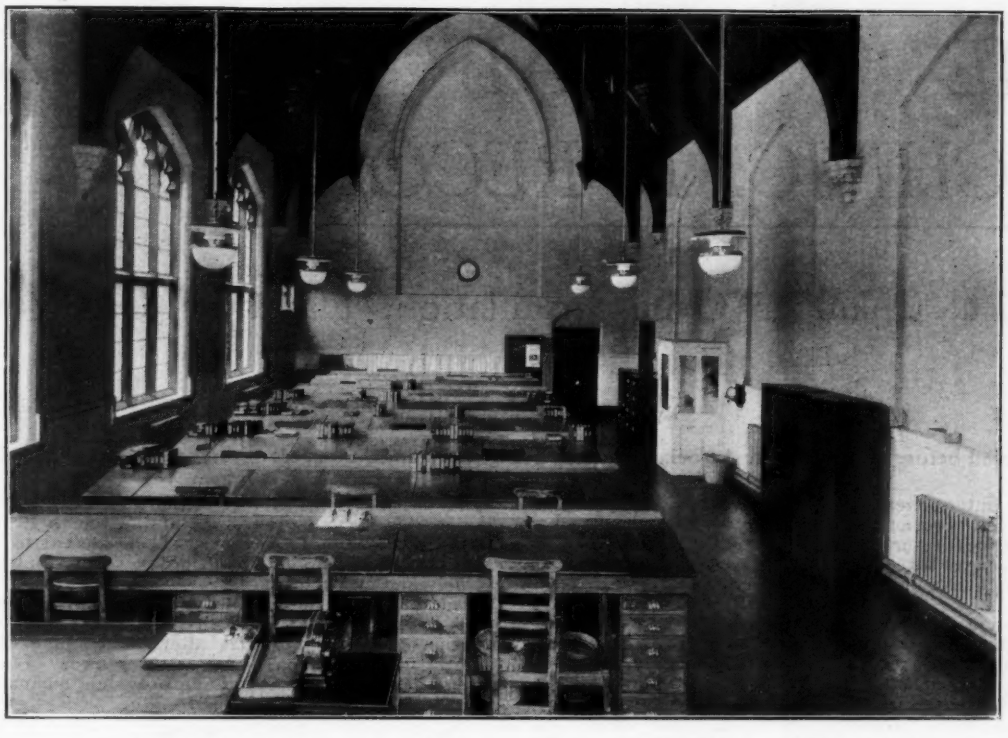
The "Kingsway" Pendants in the Entrance Lobby and Corridors.

As many readers are aware, the Tottenham and District Gas Company recently removed their Offices to Lordship Lane, Wood Green, N. 22. The building was formerly the Home and Colonial Training College, and comprises a very fine block having a frontage of over 270 ft., possessing well laid out grounds in the front of the building, which stands back from the roadway about 150 ft.

Extensive alterations have been made to the premises to render them suitable for meeting the various requirements of the Company's staff, and the building is now known as



THE CANDELABRA PENDANTS IN THE BOARD ROOM.



"BON MARCHÉ" INVERTED PENDANTS IN ONE OF THE OFFICES AT WOODALL HOUSE.

Woodall House, in compliment to the Chairman of the Company, Mr. Henry Woodall, M.Inst.C.E.

The installation of lighting, which is the outcome of most careful consideration, has been designed not only from the viewpoint of harmonizing with the general scheme of decoration, but also with a view to obtaining the utmost efficiency and suitability for the various working conditions.

In the rental, inspectors, coin meter, mains, and public lighting offices, bureau, lecture room, &c., the "Bon Marché" inverted pendant, as illustrated, has been adopted. An illustration is also given of the "Kingsway" pendant—a rather more ornate form of the "Bon Marché" pendant—which has been installed in the entrance lobby and corridors.

Specially designed candelabra pendants, each carrying six candle lamps and parchment shades, with the metal work finished in coin bronze colour, are used for the lighting of the offices of the Chairman, Directors, Chief Engineer, and Secretary.

The illumination provided affords an average intensity of 5 foot-candles throughout the general offices, without recourse to any desk pillar lighting; and the installation, while affording the fullest illumination for all demands to which it may be subjected, is very pleasing in effect, and entirely without glare.

The lighting and extinguishing of the fittings (except in very few instances) is absolutely dependable, being operated by means of the Sugg's distant control device or the Horstmann "Positive" switch. Altogether there are 190 lamps in the main office block, employing approximately 1000 No. 2 size mantles.

The entrance is lighted by two specially designed 6-burner lamps controlled by Horstmann switches, and the carriage-way has been dealt with by the provision of four 6-burner "Rochester" lamps on gate piers, and two 10-burner "Rochester" lamps on 12 ft. columns, these six lamps being operated by clockwork controllers.

The whole installation is a splendid example of thoroughness and efficiency, and the Tottenham and District Gas Company, who designed the general lay-out and determined the candle-powers of the various units, together with Messrs. William Sugg & Co., Ltd., the manufacturers of all the fittings and lamps, are to be congratulated on having produced such an excellent installation of modern, dependable, and efficient gas lighting.

IN CONTINENTAL COUNTRIES - - -

Abstract Translations from the Technical Press of France and Germany.

INCREASING THE OUTPUT OF OVOID BRIQUETTE PRESSES.

F. Hagemann in "Glückauf," 1931, 67, 889-892 (July 4), describes work carried out with a view to increasing the output of briquette presses making 2-oz. ovoid briquettes. It has always been regarded as necessary to keep the linear velocity of the rolls below 1 ft. per second, since it was believed that with high velocities there would not be sufficient time for the moulds to be completely filled and commercially good briquettes to be formed. Progressive increase in the velocity of an existing press led to the production of unsound briquettes which must have been due either to the high velocity or else to too rapid a passage of the coal and pitch through the kneading hopper where steam mixing is effected. Tests showed that the latter cause was operating and by an increase in the size of the hopper and installation of larger conveyors for the coal mixture, the output of a press could be increased by 250 p.ct. with an additional expenditure of but 40 p.ct. on the capital cost. This is equivalent to increasing the capacity of a 15 tons per hour press to nearly 53 tons. When the presses are thus worked at high capacity—*e.g.*, with linear velocities approaching 3½ ft. per second in the rolls—the total power required per ton of briquettes is approximately halved. It has been possible to run the presses at high capacity for periods of months and not merely for short test periods, and no increase in the consumption of pitch has resulted.

THE "JOURNAL" TECHNICAL RECORD

Which contains Full Reports of Meetings of Gas and Allied Associations

Vertical Chamber Oven Installation, Flathouse Gas-Works, Portsmouth

By A. H. Mills, of Portsmouth.

[A Paper read before the Southern Association of Gas Engineers and Managers (Eastern District), June 26, 1931]

The new intermittent vertical chamber oven plant is erected on a site previously occupied by an old continuously-operated vertical retort bench. This old plant has been in operation for over fifteen years, had given good service, and the time had arrived for the major portion of the settings to be rebuilt.

The question of renewal was accordingly very carefully gone into during the summer of 1929, and it was ultimately decided that the reconstructed plant should be vertical retorts of the intermittent type.

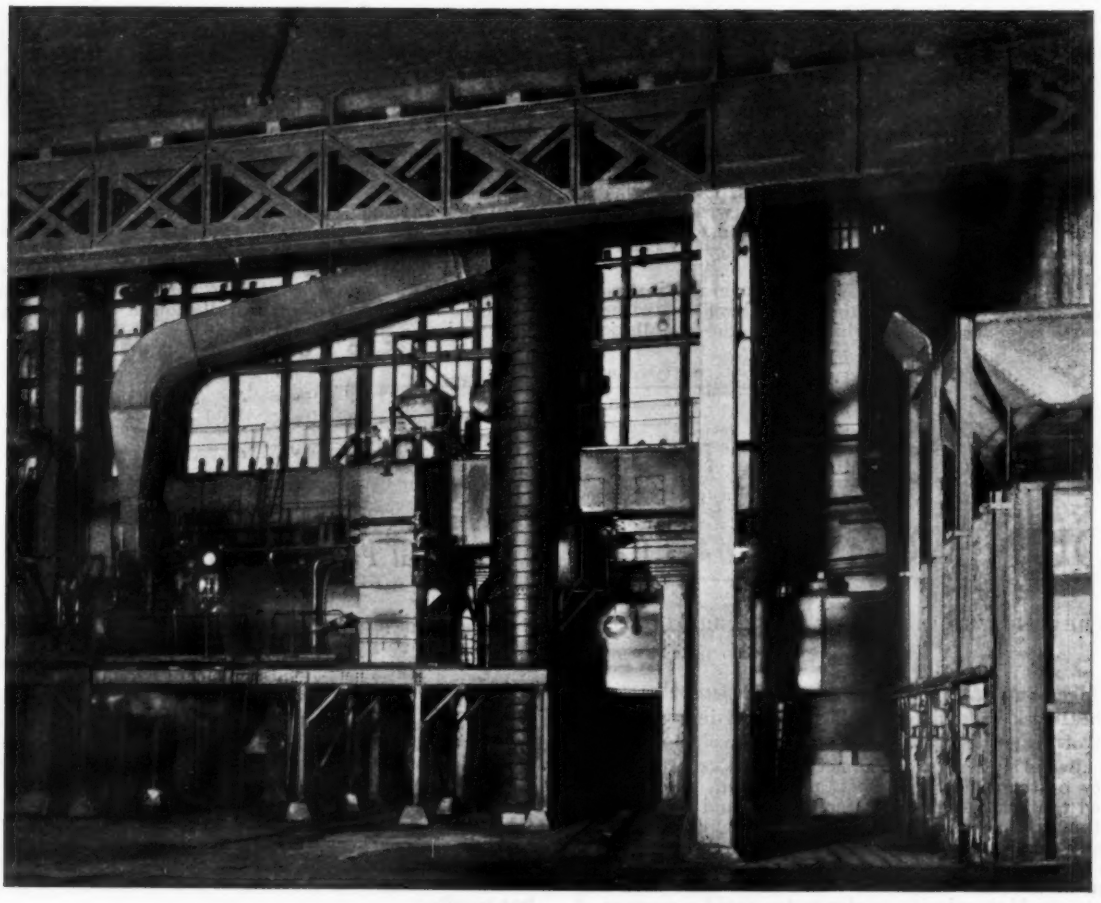
The new plant was so arranged that the existing foundations, coal breaking, elevating and conveying machinery, overhead coal and coke storage hoppers, stage floors, buckstays, and chimney were utilized.

The installation consists of four settings of five chambers each—a total of 20 chambers. The chambers are built of tongued and grooved silica blocks 9½ in. by 6½ in. by 3½ in. thick, and are almost 21 ft. in height. Their cross section is approximately rectangular, the major axis being 9 ft. 9¼ in., with a slight camber of the walls outwards, and the minor axis varying from 8 in. at the top to 12 in. at the base, giving a uniform taper. They are carried on cast-iron sole plates supported on heavy section built-up plate girders and are well braced.

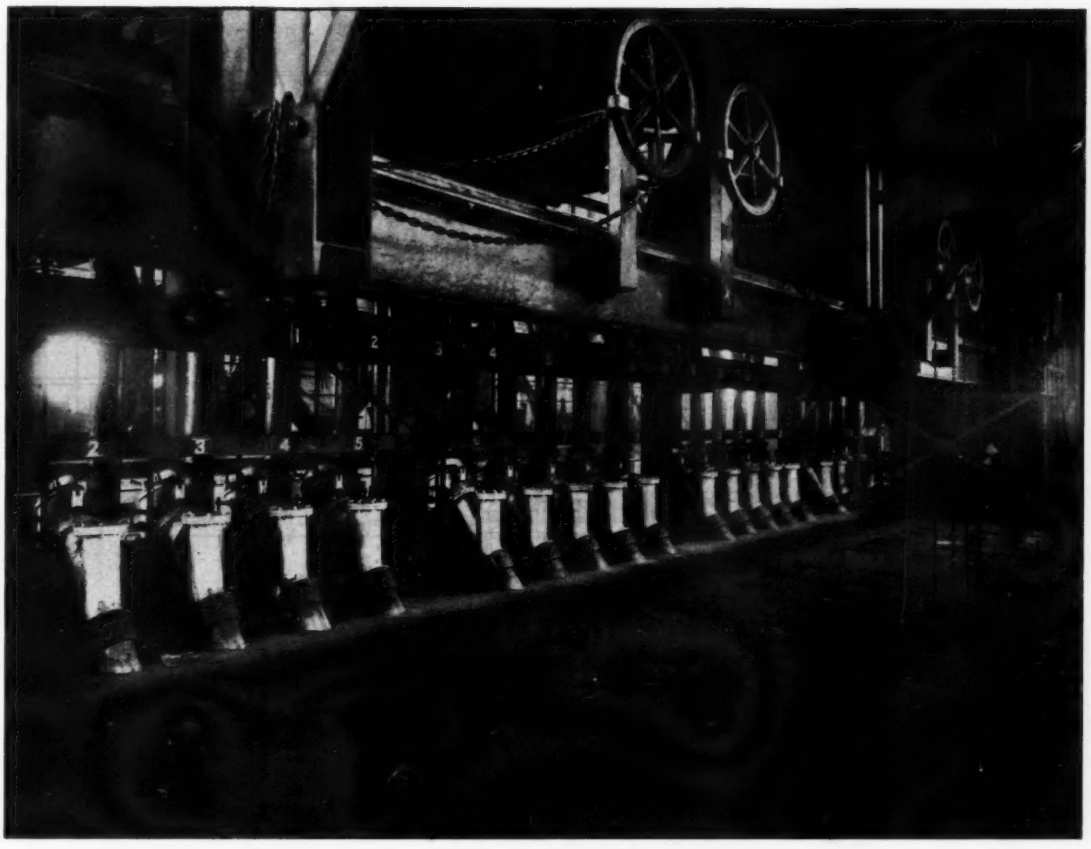
The heating of the chambers is by means of combustion flues between them, arranged so that chambers and combustion flues are situated alternately along the whole length of the bench. Bridge tiles every few courses strengthen the construction and provide a means of directing the combustion in a baffled route.

Producers.

Producer gas is supplied by a battery of four external step grate producers, any three of which are capable of supplying sufficient gas for the running of the plant. This ample producer capacity allows of re-lining and producer repairs without affecting the temperatures carried in any part of the settings.



"C.O.L." INTERMITTENT VERTICAL CHAMBERS, GENERAL VIEW.



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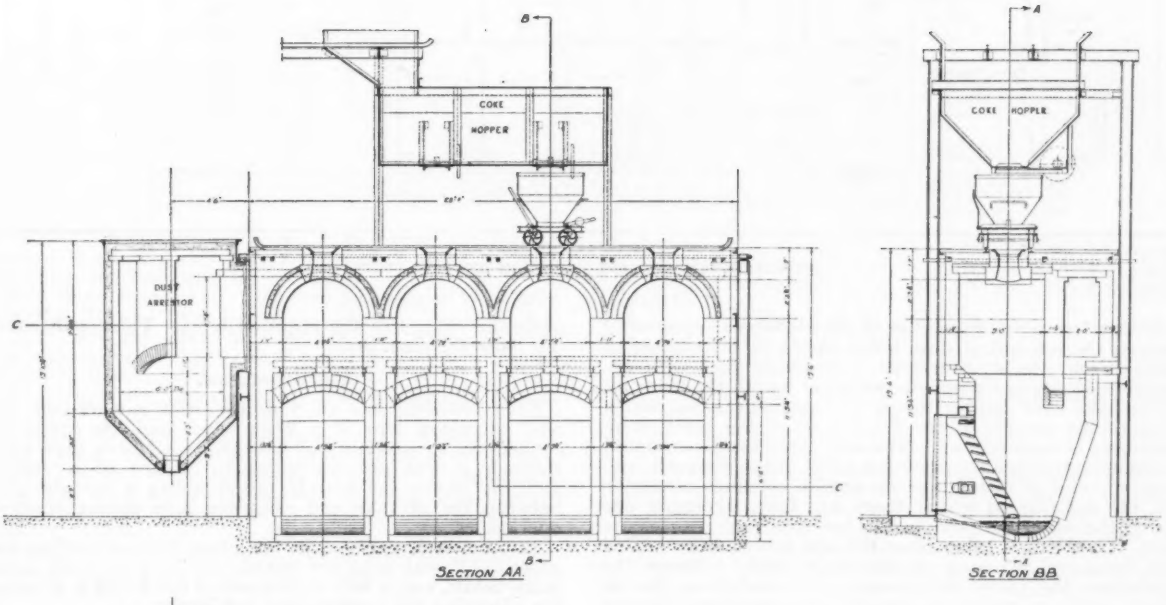
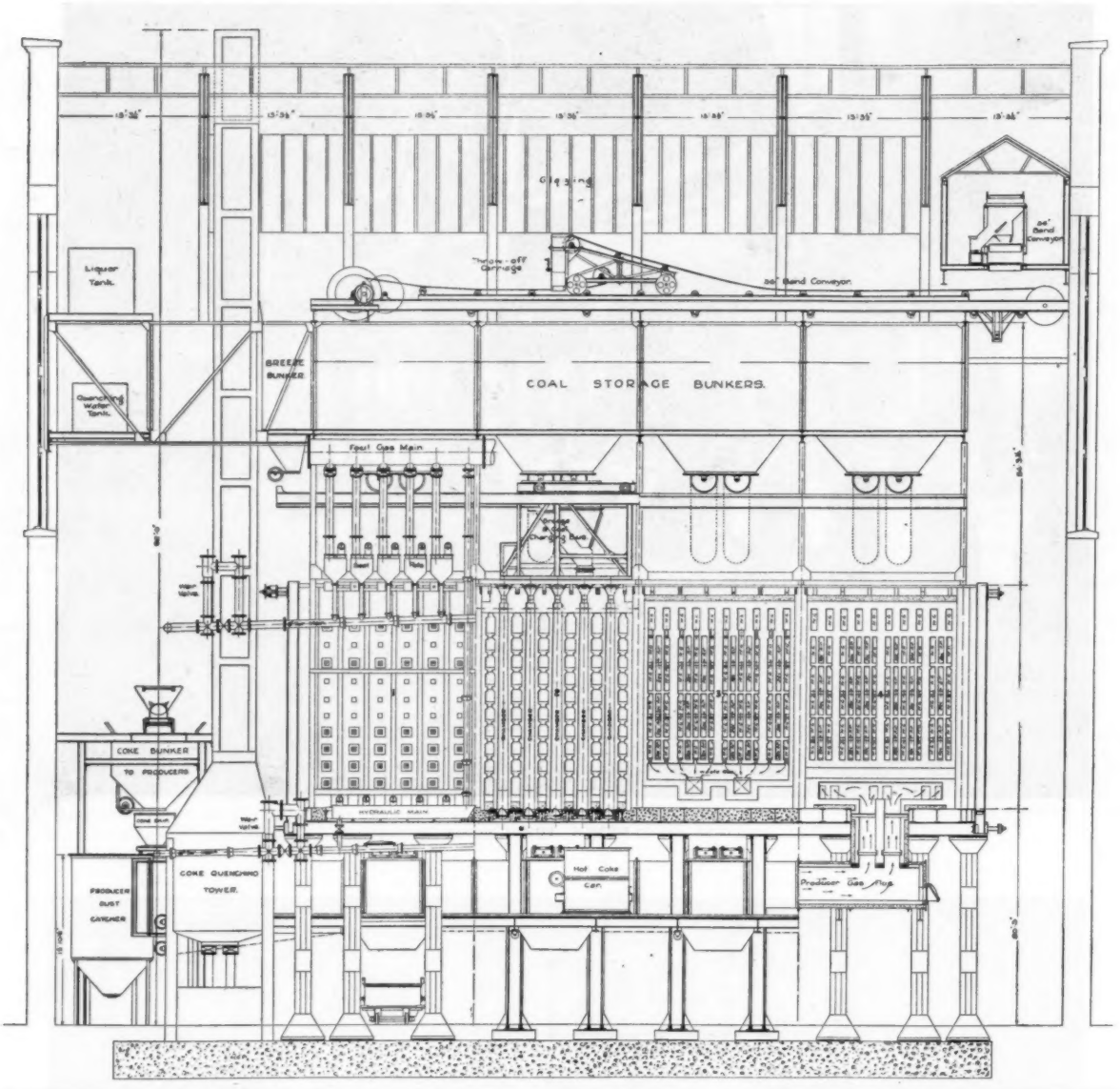


ARRANGEMENT OF PRODUCERS.



LONGITUDINAL SECTION THROUGH INSTALLATION.

A dust arrester at the outlet of the producers appreciably reduces the amount of dust which might be distributed in flues. From the dust arrester a firebrick duct with external steel casing carries the producer gas to the settings. An up-take with damper serves the distributing flue which supplies the nostrils at the lower part of the combustion chambers of each setting. The secondary air is preheated in recuperators which are corrugated brick tongued and grooved, and is introduced at similar openings alongside the CO nostrils—of which there are four, arranged one above the other for combustion between each two chambers. Combustion takes place through horizontally baffled and dampered divisions of the whole height between the chambers—the travel being somewhat similar to that of waste gases—or secondary air—in a common form of horizontal setting recuperator.

The hot waste gases leave the combustion flues at the top and pass down a recuperator (previously mentioned) of the alternate air and waste gas flue type.

The thermal efficiency of the installation is further increased by passing the still hot waste gases leaving the recuperator through a waste-heat boiler of the smoke tube type, where steam is generated at 110-115 lbs. per sq. in. A superheater for the steam to chambers is provided.

The chambers are charged by means of an electrically propelled coal and breeze car which runs on overhead rails. A breeze chamber of the car discharges about 4 cwt. of breeze, previously taken from an overhead hopper, on to the bottom door of the chamber to protect it, and then the coal is dropped into the chamber through the three openings provided, an auxiliary coal chamber serving to complete the charge to the required level. Three self-sealing lids close the chamber.

Gas Off-takes.

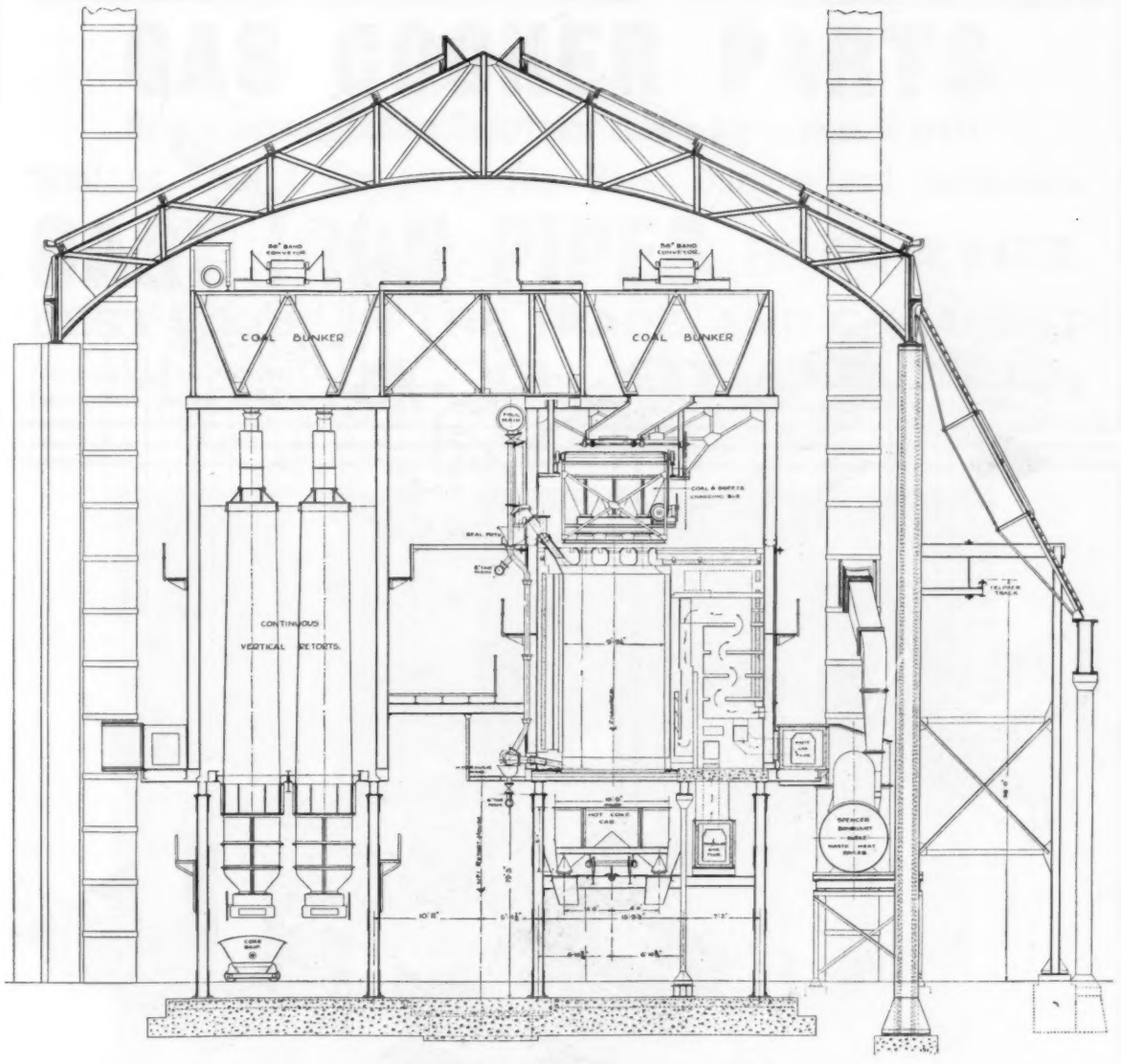
Each chamber has an 8-in. cast-iron gas off-take and 8-in. ascension pipe to a 27-in. steel foul gas main, the connection between the off-take and ascension pipe being through a seal pot, in which by means of a vertical movable sleeve the seal is raised above a curtain plate between the off-take and ascension pipe during charging operations.

Hot liquor is sprayed in the pipes for gas cooling purposes. All seal pots are connected by a tar and liquor main below, and a weir at the end of the bench is provided for adjusting the working seal pot level.

A 6-in. bottom gas off-take from each chamber delivers by means of anti-dip pipes and cup valves into one hydraulic main for each setting, each hydraulic being connected by a 6-in. ascension pipe to the main bench foul gas main above, the latter being provided with an "Arca" pressure regulator.

This liquor sealed cup valve is used for sealing off each lower gas off-take during steaming and also during charging and discharging of a chamber. The function of the lower off-take is to eliminate gas pressure in the lower part of the chambers, particularly during the first hours of carbonization.

The chambers have a capacity of 3·5 tons of coal per charge, which is carbonized in 11 to 12 hours, after which superheated steam is admitted through a manifold and jets distributed along the sides of the bottom door frame, for



CROSS-SECTION THROUGH INSTALLATION.

the production of blue water gas. The length of time and pressure of steam supply govern the quality, quantity, and consequent thermal production of gas.

The bottom doors of the chambers are made of mild steel for flexibility and have hæmatite cast-iron hoods on the chamber side for protection against the chamber heat. They are operated hydraulically and have seven evenly distributed levers, catches, and eccentric levers for closing and tightening each door. Standby hand operation is also provided.

After carbonization and steaming, the hot coke is discharged from the chamber by gravity, immediately the bottom door is released and swings back. The coke drops into a coke bus, which is propelled on rails on the stage beneath the chambers, by electric rope haulage gear until under the quenching tower at one end of the bench. Quenching is effected by water from a 600-gallon flushing tank and sprays under a 92-ft. concrete and hy-rib panelled tower.

After draining into a silt sump below, the coke is discharged by means of the bottom doors of the coke car, through hatches and chutes in the coke car stage, into existing telpher skips below.

Guarantee Test.

The plant was put into operation early in November last and has recently been exhaustively tested. A 28-days guarantee test was first carried out making a 470 B.Th.U. gross calorific value gas, and a subsequent 7-days test making a gas of 520 B.Th.U. calorific value.

Time does not permit more than a synopsis of the results obtained to be given here, but the weekly results of the 28-days guarantee test are given in detail in the appendix.

Only one variety of unscreened Durham coal was used—not a quality known as " Weir Specials." From numerous gradings of large average samples an interesting feature of the coal was that over 30 p.ct. of it was below ¼ in. in size. The moisture was 2·7 p.ct., ash 6·5 p.ct., and volatile matter 33·1 p.ct.

Reduced to a dry basis containing 6 p.ct. ash, the yields in therms per ton of coal were :—

Period of test, days	28	..	7
Calorific value	471·6	..	519·7
Therms per ton	88·11	..	82·16
Carbonization period	11·5	..	12·0
Steaming period	3·5	..	1·33
Steaming, p.ct.	12·92	..	5·18

Analyses of the gases revealed normal constituents.

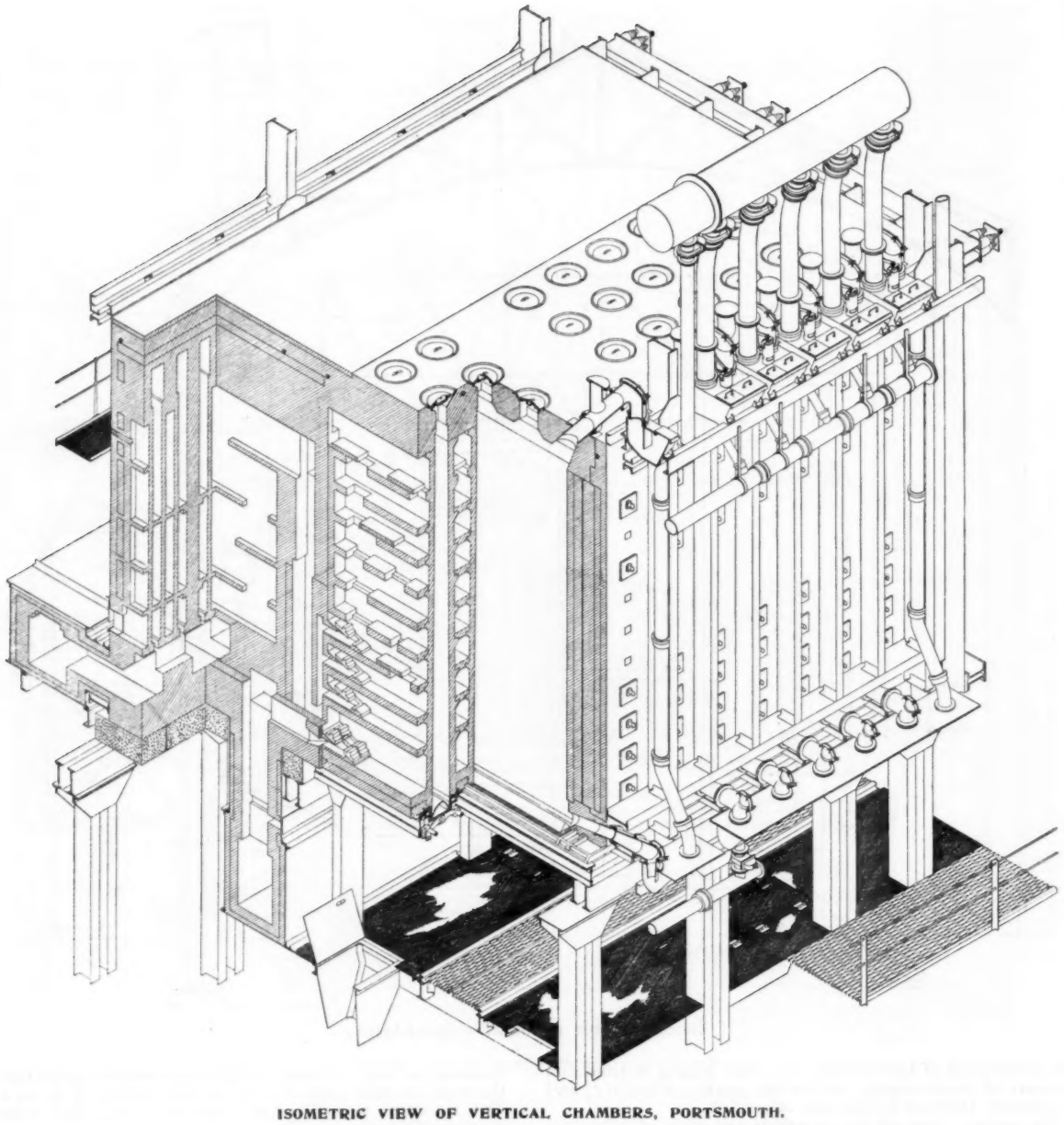
The combustion chamber temperatures worked averaged 1300° C. at the base and 1000° C. at the top and were easily maintained practically constant. The average weight of coal per charge was 3·43 tons over both tests. This gives the capacities of the plant as practically 105 and 115 tons of coal per diem at 470 and 520 B.Th.U. calorific value of gas made respectively. The fuel consumption averaged 14·9 lbs. of carbon per 100 lbs. of coal charged to chambers.

It is remarkable that the changing of the periods of carbonization and steaming for the different tests required practically no alteration in the heating arrangements of the plant. In other words—and to coin a term—the endothermicity of the water gas reaction is somewhat equivalent to that of carbonization.

The coke available for sale, reduced to a 5 p.ct. moisture basis, was 10·7 cwt. per ton during the guarantee test and 11·5 cwt. during the tests under reduced steaming conditions. Tar and 10-oz. ammoniacal liquor produced were 12 and 30 gallons per ton respectively.

The temperature of producer gas entering the settings was 684° C. and of secondary air 793° C. Waste gases enter the waste-heat boiler at 760° C. and leave it at 250° C.

The steam raised by the waste-heat boiler from and at



ISOMETRIC VIEW OF VERTICAL CHAMBERS, PORTSMOUTH.

212° Fahr. was 6241 lbs. per hour—correction being made for daily blowing down—which gives 4·12 lbs. from and at 212° Fahr. per lb. of carbon used in the producers, and 1415 lbs. per ton of coal charged into the chambers.

In conclusion, I have to thank Mr. Carmichael, our Engineer and General Manager, for the opportunity of giving you this short description of the new installation, and the results of the tests carried out with it.

APPENDIX I.

Weekly Results of Official Tests on Intermittent Vertical Chambers.

—	1st Week Results.	2nd Week Results.	3rd Week Results.	4th Week Results.	(*a*) Average Results.	(*b*)
Period of test, days	7	7	7	7	28	7
Duration of charge, hours	15	15	15	15	15	13
Period of steaming, hours	3½	3½	3½	3½	3½	1½
Coal carbonized per 24 hours, tons	106·5	104·8	106·4	104·9	105·8	116·4
Moisture *plus* ash in coal, p.ct.	9·3	10·2	8·8	8·5	9·2	9·6
Gas made per 24 hours—						
Thousands of c.ft.	1919	1801	1940	1967	1907	1770
Therms	9069	8504	9123	9270	8993	9237
Gross calorific value of gas—						
B.Th.U. per c.ft.	472·6	472·2	470·3	471·3	471·6	519·7
Gas made per ton of coal as charged—						
C.ft.	18,017	17,188	18,227	18,750	18,046	15,270
Therms	85·15	81·16	85·72	88·36	85·11	79·37
Gas made per ton of coal containing 8 p.ct. moisture *plus* ash—						
C.ft.	18,279	17,613	18,387	18,852	18,282	15,540
Therms	86·38	83·13	86·50	88·84	86·24	80·77

APPENDIX I. (*continued*).

—	1st Week Results.	2nd Week Results.	3rd Week Results.	4th Week Results.	(*a*) Average Results.	(*b*)
Fuel to producers, dry coke—						
Cwt. per ton of coal	3·47	3·41	3·49	3·42	3·45	3·24
Lbs. per 100 lbs. of coal carbonized	17·35	17·05	17·45	17·10	17·25	16·20
Steam to chambers—						
Weight admitted, p.ct. on coal carbonized	12·8	13·0	12·78	13·1	12·9	5·2
Chamber heating flue temperatures—						
Average tops, °C.	995	970	1002	1016	995	1015
Average bottoms, °C.	1294	1282	1299	1301	1295	1308
Composition of gas made—						
CO_2, p.ct.	..	..	..	..	3·6	2·1
O_2 ,,	..	..	..	..	0·6	0·5
C_nH_m ,,	..	..	..	..	2·5	3·1
CO ,,	..	..	..	..	17·0	13·6
H_2 ,,	..	..	..	..	50·0	51·6
CH_4 ,,	..	..	..	..	18·3	21·9
N_2 ,,	..	..	..	..	8·0	7·2
(*a*) Steam raised from and at 212° Fahr. per ton of coal carbonized, lbs.					1415	1134
(*b*) Fuel equivalent of steam raised (evaporative factor 9) per ton of coal carbonized, cwt.					1·40	1·15

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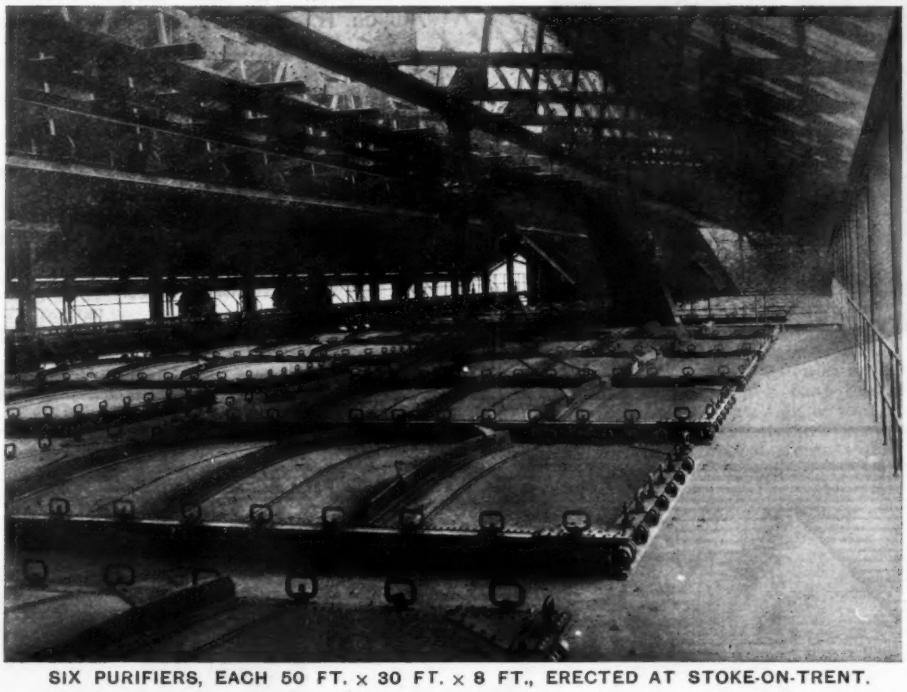

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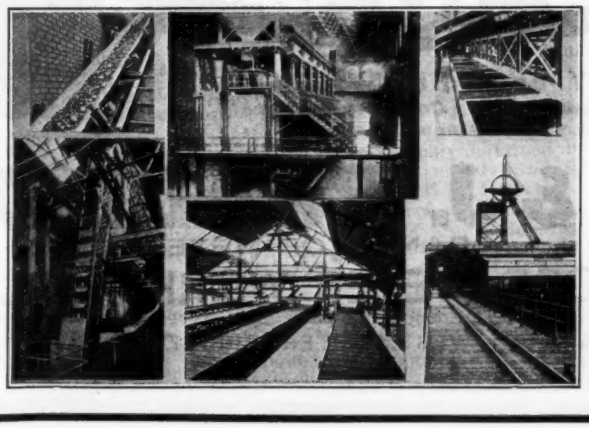

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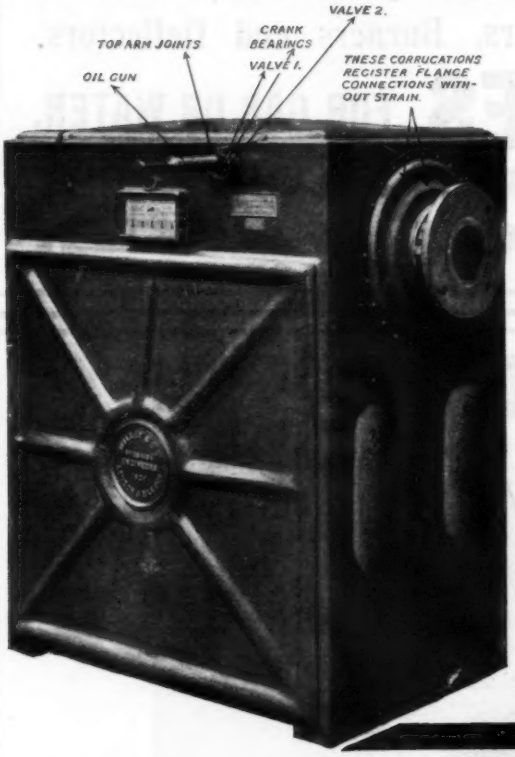

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Manchester District Institution of Gas Engineers

DILUTION OF STRAIGHT COAL GAS.

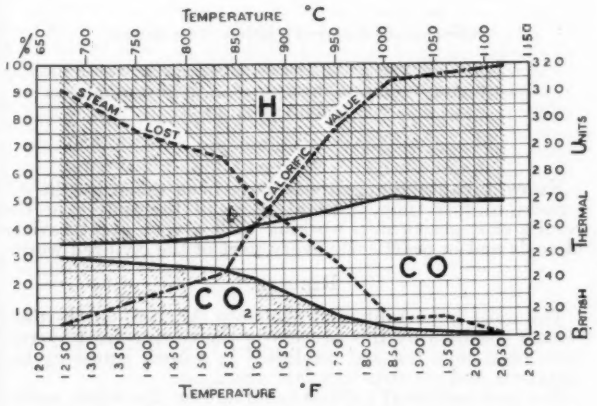
[We continue publication of the papers on this subject presented at the meeting on July 3. The contribution of Col. W. M. Carr appeared in our issue last week.]

DILUTION BY STEAMING IN VERTICAL RETORTS.

By J. E. BLUNDELL, of Carlisle.

In a paper presented to this Association in October, 1917, I made the first contribution to technical literature of results obtained in the dilution of coal gas by continuous "steaming" in vertical retorts. I pointed out that Young and Glover, in their patent of 1905, had foreshadowed the new process, and I was aware that Mr. John West was working at that time on the very same problem. It is doubtful whether any of us expected that within little over ten years this method of gas manufacture would have expanded so rapidly as to account for 50 p.ct. of the gas manufacture in Great Britain.

The theory of the method is simple. In the continuous vertical retort, by the time the charge reaches the bottom of the retort it is "coked." Steam admitted at the base of the retort reacts with the hot coke to form water gas in the ordinary way. There is, of course, more in it than that. Steam passing over or through hot carbon results in the generation of a mixture of carbon monoxide and hydrogen only so long as the temperature of the carbon is maintained at about 1000° C. The calorific value of such a mixture is about 320 B.Th.U. per c.ft. Harries and Bunte showed that a drop of 50° C. would so increase the percentage of CO_2 in the mixture as to reduce the calorific value to 300 B.Th.U., and a drop of 150° C. reduces the calorific value to 245 B.Th.U. The necessity, therefore, for a heating system in which the temperature of the retort may be maintained at the maximum towards the base is evident.



Effects of Temperature on Steaming (Harries and Bunte).

We anticipated in 1917 that the water-gas reaction would be accompanied by other interesting processes. All our anticipations were justified by the results we obtained at Macclesfield, but they were more than confirmed by the elaborate investigations carried out at Uddingston by the Gas Investigation Committee of the Institution of Gas Engineers, and by the Fuel Research Board at East Greenwich.

The effect of 5 p.ct. steaming in the carbonization of a well-known Yorkshire coal was to add 3330 c.ft. of gas, which included 450 c.ft. of methane and 66 c.ft. of unsaturated hydrocarbons, so that the calorific value of the added gas was not 320, but 401 B.Th.U. per c.ft. Even when the steaming was increased to 30 p.ct. by weight of coal carbonized, the added gas contained 395 c.ft. of methane and 97 c.ft. of unsaturated hydrocarbons, and had a calorific value of 311 B.Th.U. per c.ft., in spite of the fact that it contained 1305 c.ft. of CO_2.

It is, therefore, clearly established that, given proper facilities for heating the retorts, successive increases in the proportion of steam admitted at the base will result in the addition of gas of a calorific value which can be very safely estimated at 300 B.Th.U. per c.ft. Further, given the yield of gas per ton at any one calorific value, the yield to be expected at any other, within reasonable limits, can be calculated.

For example, if a given coal produced 15,000 c.ft. per ton of gas at 500 B.Th.U., by increasing the proportion of steam admitted to the retort until the calorific value was reduced to 450 B.Th.U., the yield should be:

$$\frac{15{,}000\ (500 - 300)}{(450 - 300)} = 20{,}000 \text{ c.ft. per ton.}$$

Results calculated in this manner have been very generally obtained in practice, as will be seen later in this paper.

The dry tar produced per ton of coal carbonized increased from 9·3 to 12·6 gallons as the steaming was increased from zero to 30 p.ct. by weight of coal carbonized, in the tests at the Fuel Research Station above referred to.

In the same tests the ammonium sulphate present in the liquor increased from 16·27 to 21·95 lbs. per ton of coal carbonized. In the tests at Uddingston by the Gas Investigation Committee these figures ranged from 32·7 to 39·4 for an increase in steam from zero to 44·8 p.ct. by weight of coal carbonized.

EFFICIENCY.

Assuming a standard gas-making coal, such as would give a yield of 13,000 c.ft. per ton of gas at 540 B.Th.U. steamed to produce 20,000 c.ft. per ton of gas at 456 B.Th.U., we should have the following calculation for the efficiency of the process. It is assumed that the steam used in the process would be generated in a waste-heat boiler of the most approved Spencer-Bonecourt induced-draught type, in which as much as 5 lbs. of steam would be raised per lb. of coke consumed in the producer; it is found in practice that only some 25 p.ct. of the steam raised in such a boiler is utilized in the gas-making process.

1 Ton of Coal.		B.Th.U.
2240 × 14,000 B.Th.U.		= 31,360,000
Yield—		
Gas, 20,000 c.ft. at 456 B.Th.U.		= 9,120,000
Coke, *less* producer fuel (dry)—		
Total make	1456 lbs.	
Producer fuel	334 ,,	
Converted in steaming	111 ,,	
	445 ,,	
Balance	1011 lbs.	
1011 lbs. at 12,700		= 12,840,000
Tar, 198 lbs. at 16,740		= 3,315,000
Surplus steam, 1421 lbs. at 970·7		= 1,379,000
		26,654,000

$$\text{Efficiency} = \frac{26{,}654{,}000}{31{,}360{,}000} \times 100 \text{ p.ct.} = 85 \text{ p.ct.}$$

COMPARISON WITH MIXED GASES.

To compare this efficiency with that obtained in the mixture of straight coal gas with water gas manufactured in a separate generator, it is necessary to assume the calorific value of the straight coal gas. I am aware that it is sometimes claimed that gas is made in horizontal retorts at calorific values less than 540 B.Th.U. from such coals as we have adopted as a basis, but it is submitted that lower values are only obtained by over-pulling or by excessive carbonizing periods, and that a make of 13,000 c.ft. per ton at 540 B.Th.U. represents the best practice for the production of straight coal gas. On this assumption, then, 7000 c.ft. of blue water gas at 300 B.Th.U. calorific value would have to be supplied from a separate generating plant. And we shall not be far out if we calculate the coke consumption at the rate of 43·8 lbs. per 1000 c.ft. of gas generated, the figure given in the Sixth Report of the Gas Investigation Committee, 1921. At this rate 306 lbs. of coke will be required. It is assumed that the necessary steam both for the process and for the blast would be generated in a waste-heat boiler, but that there would be no surplus

for other purposes. The efficiency calculations would, therefore, be as follows:

1 Ton of Coal.		B.Th.U.
2240 × 14,000 B.Th.U.		= 31,360,000
Yield—		
Gas, 20,000 c.ft. at 456 B.Th.U.		= 9,120,000
Coke—		
Total make	1456 lbs.	
Producer fuel, 12½ p.ct.	280 ,,	
Water gas production	306 ,,	
	586 ,,	
Balance	870 lbs.	
870 lbs. at 12,700		= 11,049,000
Tar, 110 lbs. at 16,740		= 1,841,400
		22,010,400

$$\text{Efficiency} = \frac{22{,}010{,}400}{31{,}360{,}000} \times 100 \text{ p.ct.} = 70 \text{ p.ct.}$$

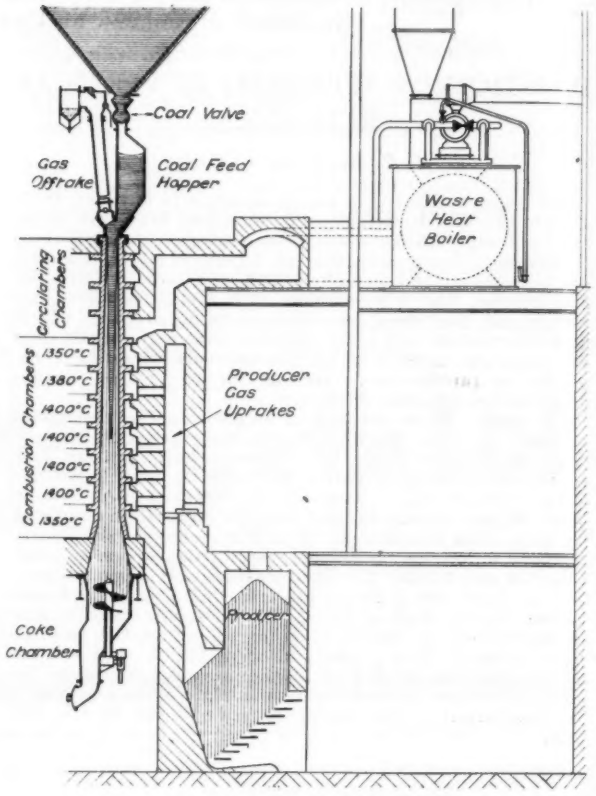
Naturally, there are certain assumptions made in the calculation of these figures, but it may be taken as substantially correct that for any good standard gas coal the efficiencies of the two processes will be proportional to 70 p.ct. in the case of a mixture of straight coal gas with blue water gas generated in separate plant, as against 85 p.ct. in the continuous vertical retort in which a gas of about 450 B.Th.U. calorific value is manufactured in the single process with steaming.

Apparatus.

Steaming is now general in all forms of continuous vertical retorts, but the system in which it was first developed, and with which I am most familiar, is the Glover-West. To quote the words of the Director of Fuel Research: "The Glover-West retort, owing to its provision of means by which the temperature from top to bottom can be controlled by a series of horizontal combustion chambers, was selected as the most suitable for our immediate purpose," which was, of course, to study the effects of steaming. The retorts actually built at the Fuel Research Station differed in no material point from those in which my own experiments at Macclesfield were carried out, but a later and most important development has been the addition of the so-called "steaming chamber" at the base of the retort. Added to the length of the retort at the base is an extension in which the cross-section is rapidly expanded from the ellipse to a circle. The effect of this addition is to open out the charge of coke to secure intimate contact with the incoming steam and to provide a zone in which the temperature of the steam is raised to the point of dissociation before it enters the retort proper. The secondary air circulating chambers which were a feature of the earlier designs have been entirely abolished in the New Model, and the whole of the cooling of the residual coke is effected by the steam. The whole vertical length of the retort is surrounded by the adjustable combustion chambers except the top two or three sections, which are surrounded by waste gas circulating chambers, just as in the original designs. Careful attention should be paid to the zoning of the temperatures.

Dry and lightly superheated steam is admitted to the upper portion of the coke receiving chambers below the retorts. Its quantity is controlled by a specially designed graduated needle valve. This valve does not give any accurate measure of the steam admitted, but it does permit of a relative estimation of the steam as required for one coal compared with another, and for one calorific value as compared with another.

There is a fundamental difference between the method of working in the retort house and that in the research plant which is sometimes not clearly recognized. In the retort house the speed of carbonization and the proportion of steam admitted to the retorts are adjusted to obtain the greatest possible production per retort and the most economical yield per ton of coal when making gas at a predetermined calorific value. The throughput of coal per retort is a secondary matter. It is necessary to bear this point in mind when comparing results obtained in practical working with those obtained in some of the published investigations, particularly those of the Fuel Research Board, in which the throughput of coal per retort has been generally standardized, for reasons which are not always obvious.



Temperature Zoning of a Glover-West Retort.

The figures given are the maximum temperatures necessary when steaming a good Yorkshire coal to produce gas at a calorific value of about 450 B.Th.U.

Every advantage appears to have been taken by the designers of this type of plant to avail themselves of the results of experience in working with a very great variety of coals and in practically every part of the civilized world.

Results.

The most important, and probably the most interesting, results obtained by this process in the Glover-West system have been collected and published in a book issued by the designers and constructors last year.

Our own results at Carlisle tabulated for the whole period since the introduction of continuous verticals show that these results are maintained over long periods. The coals carbonized are, in the main, obtained from the Cumberland coalfield, and are not so rich as those from Yorkshire. A make of 19,850 c.ft. of gas at 450 B.Th.U., or about 90 therms, per ton is an excellent result with these coals.

The following table shows the principal figures of the returns for the last eight years:

—	1923-24.	1924-25.	1925-26.	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.
Calorific value of gas per c.ft., B.Th.U.	450	444	447	428	447	449	450	451
Make of gas per ton of coal carbonized, c.ft.	18,731	19,080	18,720	18,200	19,674	19,850	19,178	19,103
Gas heat produced per ton of coal carbonized, therms	84·28	84·7	83·7	77·9	88·0	89·28	86·30	86·15
Coke and breeze made per ton of coal carbonized, cwt.	14·0	13·9	13·5	13·9	12·9	13·2	12·9	13·2
Coke and breeze saleable per ton of coal carbonized, cwt.	8·9	8·2	7·6	9·3	8·2	8·7	9·3	9·3
Tar made per ton of coal carbonized, galls.	16·4	16·0	16·2	13·2	15·5	15·9	15·9	15·1
S/A made per ton of coal carbonized, lbs.	31·8	28·2	28·8	27·5	22·8	27·2	26·0	24·4

The retort settings have been improved both in design and in operation since their first installation, and these improvements are reflected in the improved results towards the latter end of the period under review. It would be out of place in this paper to enter into the question of maintenance, but it may be remarked that at Carlisle our expenditure on renewals and repairs works out to a very low figure per million of gas made.

Steaming to the Limit.

In the Fourth Report of the Gas Investigation Committee on their tests at Uddingston, particulars are given of two tests made " with the object of ascertaining to what extent it is possible to gasify coal inside the retort by the action of steam." In Test A some success was obtained in reducing the calorific value of the gas to the gross value of 338 B.Th.U., making approximately 47,500 c.ft. of gas per ton of coal treated equivalent to about 160 therms per ton. It was evident, however, that neither the retort nor the heating system at Uddingston was able to maintain a sufficient temperature at the base of the retort to maintain production at this level.

In 1925 West's Gas Improvement Company, at their research plant in Manchester, carried out a complete series of tests in a New Model Glover-West retort, to ascertain the limit of steaming consistent with continuous operation. They selected the well-known Wigan Arley (Lancashire) coal, mainly on account of the fact that the results would thus link up with a very long series of tests carried out in their other type of retort.

During the series every possible effort was made to secure coal of the same composition and properties, and it is believed that this is the only complete investigation of its kind ever carried out under full-scale conditions. The following figures are quoted from " Results in Glover-West Vertical Retorts," published in March, 1930:

Test No.	A.	B.	C.	D.	E.	F.	G.
Gas—							
Cal. value B.Th.U. c.ft. (gross)	503	472	445	423	401	373	360
Make per ton, c.ft.	16,970	19,120	22,600	27,380	30,350	43,370	53,180
Therms per ton	85·3	91·2	100·6	115·8	121·7	161·8	191·4
Coke—							
Make per ton, cwt. (dry)	13·45	13·36	12·43	12·04	11·83	11·45	10·96
Tar—							
Make per ton in galls. (dry)	11·3	16·9	23·6	22·1	21·8	25·2	25·3
Ammonia—							
Sulphate in lbs. per ton	13·2	12·6	19·1	17·9	18·9	21·3	..

These results, plotted against " steaming curves " which are drawn on the assumption that the calorific value of the " added gas " is 300 B.Th.U., show that the figures in practice agree remarkably well with the " theory."

These investigations also established conclusively for the first time that steaming has in itself no detrimental effect on the quality of the coke from the point of view of ash content. It was, of course, always obvious that the action of the steam could only affect the outside of the individual piece of coke and that the ash content of the coke actually gasified by the action of the steam would appear in the breeze.

The following table quoted from the same source shows this point very clearly:

Test No.	A.	B.	C.	D.	E.	F.	G.
Calorific value of gas made	503	472	445	423	401	373	360
Coke over 1 in. screen—							
Percentage of make	85·0	82·1	79·2	76·1	73·6	70·0	61·3
Moisture, p ct.	0·78	0·85	0·55	1·52	0·89	2·42	5·30
Ash	10·56	8·50	11·20	8·92	9·33	12·95	17·60
Volatile combustible matter, p.ct.	*Nil*	0·31	0·84	0·36	0·92	1·12	1·20
Coke nuts through 1 in. and over ½ in. screen—							
Percentage of make	7·1	8·8	10·3	11·7	12·1	12·9	16·4
Moisture, p.ct.	0·65	0·65	0·85	1·85	0·94	3·15	2·50
Ash	17·72	16·20	18·05	15·82	11·06	16·45	24·20
Volatile combustible matter, p.ct.	0·51	0·83	1·15	0·17	0·99	0·94	0·20
Breeze through ½ in. screen—							
Percentage of make	7·9	9·1	10·5	12·2	14·5	17·1	22·3
Moisture, p.ct.	0·70	0·75	1·55	1·97	1·44	3·28	2·50
Ash	18·80	12·55	17·23	26·72	27·48	29·05	34·40
Volatile combustible matter, p.ct.	0·48	0·03	1·35	0·99	1·32	1·25	1·72

The Fuel Research Station has also shown (Survey Paper No. 9) that the coke produced when steaming to 450 B.Th.U. gives results in steam raising and in water-gas generation which are identical with those obtained with coke produced when making gas at 500 B.Th.U.

Conclusion.

The practice of steaming in continuous vertical retorts has become so generally adopted that it is difficult to say anything original about it. Looking back to its inception one can say that practically all the benefits anticipated have been fully realized, and that most of the ill-effects which were feared have not materialized to any appreciable extent.

No-one disputes now that we have succeeded by this means in obtaining additional and very valuable therms per ton out of all proportion to the expenditure of coke, and without any detriment to the quality of the coke. On the other hand, the fears that steaming would in some way damage the refractories of which the retorts are constructed have proved unfounded. The life of retorts, now that steaming is practised, is not less than it was before that practice was adopted. On the other hand, the volume of gas made per retort during its life has been considerably increased.

There is no doubt whatever that the continuous vertical retort, operated in conjunction with the process of steaming, has given to the gas engineer an instrument of greater efficiency than he ever possessed before. It has given him a carbonizing plant free from the nuisances which used to characterize the gas-works; a plant which effects in one operation what could only be done, before its introduction, in two; a plant which not only quenches the coke within the retort, but recovers and retains in the system the residual heat of the coke—heat which was formerly lost, or otherwise only recovered in separate, costly, and not very efficient apparatus.

DILUTION OF HORIZONTAL RETORT GAS.

By J. H. Clegg, of Burnley.

In discussing a method of dilution of straight coal gas it is first necessary to decide what should be the final calorific value.

Although it does not necessarily follow that a high calorific quality of gas, having regard to its composition and the quantity of air demanded for complete combustion, is really the best for the consumer, on the other hand, a low calorific value gas has serious disadvantages not only to the consumer, but to the finances of the gas undertaking distributing it.

To distribute (say) 20 p.ct. more volume to perform the service required by the consumer, can only be justified if the saving in cost of production outweighs the increased standing and maintenance charges which arise in consequence of the larger mains, services, and meters which ought to be provided, and upon the increased capacity required of works subsidiary plant. These charges are not easily assessed, and in many cases are not directly noticeable, because the plant and distribution system may have been laid in the first instance with a wise provision for increased demands. I am afraid these losses are often ignored in the desire to produce large thermal yields in carbonization. The lowest cost into holder does not always correspond with the highest gaseous yield per ton of coal, likewise the lowest into holder cost does not always result in the lowest available selling price to the consumer; comparisons between gas undertakings cannot therefore be lightly or superficially made. I am of the opinion that the calorific value of gas which should be distributed should

closely approach the highest value which can be the most economically and at the same time consistently produced. Very few gas undertakings deem it advisable to supply town gas at a higher value than 525 B.Th.U. gross; in fact, by far the majority range between that figure and 425 B.Th.U. It is therefore necessary to dilute the straight coal gas produced from any settings which are in a sound condition.

Overpulling will result in a low thermal yield, and brings other troubles in its train. As the consumers' interests are safeguarded by the Gas Regulation Act, dilution is a proper procedure, and it therefore remains for the undertaking to consider the most suitable composition to give the best service at the lowest all-round expense.

The quality which we distribute at the moment is 475 B.Th.U. gross. We installed a water gas plant for the purpose of standby manufacture and for dilution, but as there was a lack of information on this subject we never intended that water gas dilution would be rigidly adhered to. In fact the publication of the carbon monoxide scares in the Daily Press some years ago nearly resulted in the exclusion of a water gas plant, some members of the Town Council being considerably influenced thereby.

Our system of carbonization is to work with 12-hour charges placed in the retorts during two shifts of eight hours with a four-hour break in between shifts, during six days per week, with 24-hour charges on the Sunday. There is, of course, some variation in the composition of the gas during the 24 hours' production, but an average test produced gas of about 565 B.Th.U. gross. An analysis of this gas is as follows:

	P.Ct.		P Ct.
CO_2	2·5	CH_4	27·5
O_2	0·4	H_2	43·6
CO	7·2	N_2	13·6
C_nH_m	5·2		

To dilute this gas we have used blue water gas with a calorific value of 273 B.Th.U. gross with a composition as follows:

	P.Ct.		P.Ct.
CO_2	4·6	CO	38·4
O_2	0·4	N_2	10·0
H_2	46·6		

This has resulted in a gas similar to the analysis:

	P.Ct.		P.Ct.
CO_2	3·8	C_nH_m	3·9
O_2	0·4	CH_4	18·4
H_2	44·7	N_2	11·1
CO	17·7		

475 B.Th.U. gross.

That it is not uneconomical to produce a high-quality coal gas is shown by the yield of 72·72 therms per ton of coal carbonized at H.M. Fuel Research Station (see paper by Mr. Percival in February, 1930). To dilute coal gas of the quality of 565 B.Th.U. to 475 B.Th.U. requires, however, about 31 p.ct. of 273 B.Th.U. blue water gas, a quantity we did not desire to produce, although the resulting gas was quite of good composition.

We therefore decided to dilute by two stages, primarily by introducing flue gases from the outlet of the waste-heat boiler. Taken from this point the diluent approximates closely the temperature of the gas in the foul main, and there is very little dust to remove after it has passed through the boiler. The diluent is admitted into the foul main at the end furthest from the condensers and has a good opportunity of mixing with the coal gas. The quality of the diluent is, of course, subject to fluctuations depending upon the condition of the fires, and the number of settings working. Cold settings tend to admit air through the dampers, &c. A typical analysis of those gases is as follows:

	P.Ct.		P.Ct.
CO_2	14·0	CO	0·2
O_2	5·8	N_2	80·0

The resulting mixture is typically analyzed as follows:

	P.Ct.		P.Ct.
CO_2	3·9	CH_4	24·0
O_2	1·0	H_2	38·9
CO	6·5	N_2	20·9
C_nH_m	4·8		

499 B.Th.U. gross.

The admission of the flue gases is regulated by means of a butterfly valve operated when required by the retort house foreman. The mixture arrives at the inlet to the exhausters, where it is further diluted with blue water gas to the required quality of 475 B.Th.U. In our case the main admission valve is set to give the minimum quantity required, and the balance to give the exact degree of dilution is admitted through a small main with a finer admission valve. The calorimeter being connected to the outlet of the washer, the time lag is quite low, and a regular quality of gas can be maintained by the attendant. This regulation could be performed automatically if desired. The average admission of the water gas is about 10 p.ct. and the gas passing into the holder as follows:

	P.Ct.		P.Ct.
CO_2	3·9	CH_4	21·6
O_2	0·6	H_2	39·8
CO	9·9	N_2	19·9
C_nH_m	4·3		

In considering dilution and the resulting composition of gas, I think it is most important from the appliance salesman's point of view that the gas should be low in sulphur compounds. The effect of sulphur compounds has, I think, done much towards the prejudice against gas for internal lighting, which exists to a certain extent at the present time. By this method of dilution our sulphur compounds are often as low as 8·5 grains per 100 c.ft., but this, of course, is controlled in the first instance by the class of coal used having a low sulphur content.

It may be pointed out that the percentage of nitrogen is rather high, but this, I think, only confirms my assertion that it is unwise to convey more gas through the distribution sytem than is necessary within certain limits. Nitrogen has, of course, to be admitted with oxygen at some point to complete the combustion of the gas. A gas which requires more oxygen for its combustion and produces more water of condensation will give a lower flame temperature in relation to its calorific value.

I think it is important to preserve a reasonably narrow margin between the gross and net calorific values of the gas we supply. The temperature of the combustion of hydrogen is high, and reduced efficiency is encountered in non-condensing appliances and internal combustion engines. In other words, 1 lb. of hydrogen after combustion produces 9 lbs. of water, and although the latent heat of liquefaction goes to the credit of hydrogen in a calorimeter test, it is not always realized in use. An important point, however, in favour of hydrogen is its low specific gravity. From a utility point of view a good percentage of carbon monoxide is an advantage.

We find that we can produce blue water gas at a cost for fuel and labour of 2·02d. per therm, and the cost of maintenance of a water gas plant, based on the five years' observation of our old plant worked at half capacity during that period, was 0·11d. per therm of water gas produced. The total cost of 2·13d. per therm compares favourably with our cost of coal gas into holder. This figure is based on a price for coke of twenty shillings per ton. The cost of production of water gas varies with the size of unit by which it is manufactured, the larger units reducing costs by the larger production per man. On the other hand, for a small percentage dilution the capital costs are increased not only on account of the size of the plant, but because of the necessity of providing a large relief holder to store sufficient gas produced in one shift to provide regularity of mixing during 24 hours.

The information set forth must not be regarded as our standard practice during the last few years; we have varied

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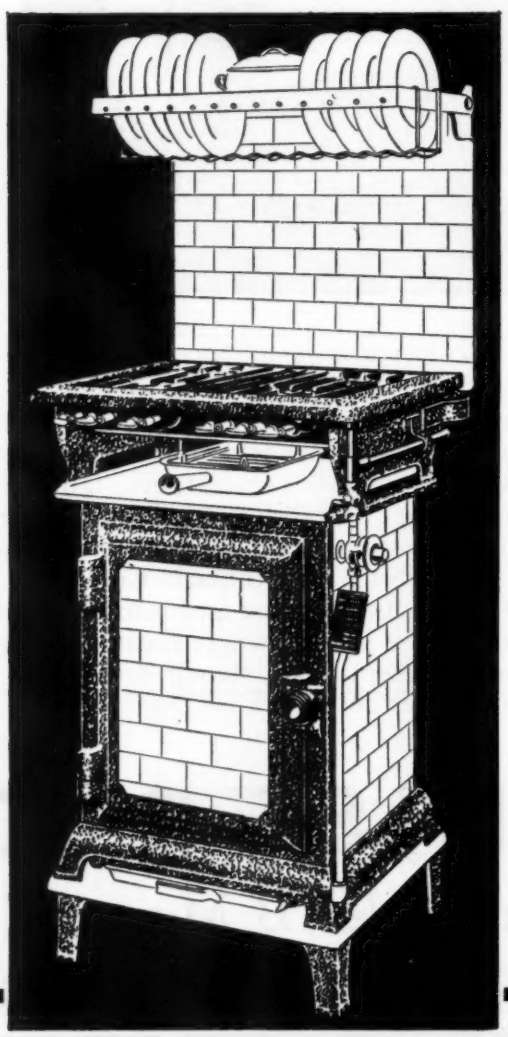

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our programme repeatedly, with the object of ascertaining the best means of dilution, and the extent to which dilution should take place.

Although I consider the provision of a water gas plant an important feature of a gas-works, I am not satisfied that we have attained the ideal method of dilution, as constant vigilance is necessary to produce the desired result. I may say that we expect shortly to increase our declared calorific value to 500 B.Th.U.

It was a happy thought of the President to inaugurate a discussion on the subject of the dilution of straight coal gas, and I hope that from it will emerge information which will be of considerable benefit to us all.

INSTITUTION OF GAS ENGINEERS

Mr. Holton Replies to the Written Contribution of Mr. Shapley (" JOURNAL " for June 24) on the Paper Dealing with Semi-Direct Recovery of Ammonia.

Mr. A. L. Holton agrees with Mr. Shapley that, while there is a saving in the capital expenditure where the semi-direct process is adopted, such saving can be easily wiped out by increased labour charges. This fact was referred to in the paper, but, with the experience gained and cited, the plant should be so designed as to ensure a definite saving on the labour costs at Partington.

The present efficiency of the electrostatic tar extractors has undoubtedly altered the position, and, in view of the experience obtained at Partington, the direct process of ammonia recovery is the next step forward in gas-works practice.

Mr. Shapley rightly emphasizes the advantage in the direct or semi-direct process where difficulty is encountered in the disposal of the effluent. Under these two systems, the liquor is treated as produced—no storage being provided—and the oxygen absorption bodies are therefore reduced to the lowest possible figure.

With regard to the efficiency at which the dephenolating plant is expected to work, the contractors have guaranteed 90 p.ct., and this figure is exceeded in most of the cases given by Dr. Monkhouse on the report of his visit to the various phenol recovery plants in Germany in 1929. (5th Report of the Liquor Effluents Sub-Committee.)

The primary function of the carbon filters is the removal of the benzole dissolved in the ammoniacal liquor in the phenol washer, which would otherwise be lost to the process. The carbon filters, however, also absorb a certain quantity of both monohydric and polyhydric phenols. To be of any value, the full working data, including the life of the filters, absorption curves, &c., can only be given after a somewhat lengthy trial.

Parliamentary Intelligence

[From Our Special Correspondents.]

House of Lords.

The following Special Orders have been laid before the House and referred to the Special Order Committee of the House of Lords: The Abergavenny Gas Order, 1931, proposed to be made on the application of the Mayor, Aldermen, and Burgesses of the Borough of Abergavenny; the Wombwell Gas Order, 1931, proposed to be made on the application of the Urban District Council of Wombwell; the Cheltenham and District Gas Order, 1931, on the application of the Cheltenham Gaslight and Coke Company; and the Dudley, Brierley Hill, and District Gas Order, 1931, on the application of the Town of Dudley Gaslight Company.

The Wandsworth and District Gas Order, 1931, has been reported from the Special Orders Committee and approved.

The following Bills and Acts received the Royal Assent on July 8: Ministry of Health Provisional Orders Confirmation (Stretford and District Gas Board); Gas Light and Coke Company's Act; and the Royston and Brodsworth Gas Bill.

The Sheffield Gas Bill, the opposition having been withdrawn, was referred to the Unopposed Bills Committee on July 9, and reported, with amendments.

House of Commons.

Special Orders.

Copies have been presented of drafts of Special Orders under the Gas Undertakings Acts on the application of the Town of Dudley Gaslight Company; the Mayor, Aldermen, and Burgesses of the Borough of Abergavenny; the Urban District Council of Wombwell; and the Cheltenham Gaslight and Coke Company. These have been ordered to lie upon the table of the House.

The Wandsworth, Wimbledon, and Epsom Gas Order has been approved by the House.

Private Bills.

The Edinburgh Corporation Transport Gas and Finance Bill has been referred to the Examiners, who are meeting to consider it on July 23.

Legal Intelligence

New Romney Gas Light and Coke Company, Ltd.

In the Companies' Court of the Chancery Division, on Monday, before Mr. Justice Maugham, the New Romney Gas Light and Coke Company, Ltd., successfully applied for permission to substitute memorandum and articles for deed of settlement and to extend its objects.

Mr. BUCKMASTER (for the Company) said the concern was a very old one. It was formed in 1853. The main reason for the petition was that, in the deed of settlement, the operations of the Company were confined to a very small area, and owing to the growth of building operations in the locality, there was a greater demand for gas over a very much larger area. The Company also desired to supply heating as well as lighting facilities.

The application was granted.

Corporation Undertakings' Results for 1930-31.

LEICESTER.

The total gas sold was 2,740,090,295 c.ft., a decrease of 1·88 p.ct. New consumers numbering 1404 were connected up, the total number now being 80,216. New and additional gas cookers and other gas appliances to the number of 2237 were acquired through the Department. The total expenditure on revenue account was £444,660, compared with £447,073 in the previous year. The cost of coal, oil, and coke for the manufacture of gas was £175,224, being less by £5422 than in 1929-30. The total quantity of coal and its equivalent used was 159,265 tons, compared with 166,734 tons in the preceding year, the cost per ton being slightly higher than in that year. Total receipts amounted to £594,334, very closely approximating receipts in the previous year. Gas sales brought in £510,013, compared with £507,744 last year. Receipts from residual products were again disappointing, yielding the sum of £64,023, or £4777 less than that for 1929-30. Coke, tar, and ammonia returned to the Department 36·54 p.ct. of the cost of coal, whereas pre-war 75 p.ct. was a usual return. The balance from revenue account is £149,674, compared with £148,519 last year. The total credit to net revenue account is £152,438, the difference between these figures being made up of sundry interest credited, amounting to £2764. The make of gas was 17,500 c.ft., or 79·28 therms, per ton of coal carbonized, and the sale was 17,205 c.ft. per ton. The coke sold per ton was 8·61 cwt. There was produced per ton of coal 15·19 gallons of tar and 27·65 lbs. of sulphate of ammonia.

NANTWICH.

At a meeting of the Nantwich Urban District Council, Mr. Boardman, in proposing the confirmation of the Gas Committee's minutes, said that, in spite of the trade depression during the year ended March 31, 1931, the accounts of the Gas Department revealed another successful and satisfactory year and continued progress. The loan debt had been reduced this year from £50,232 to £47,745. This was a reduction of £2487. The gross profit earned during the year was £8615, and this had enabled them to meet all the annual interest, repayment, and sinking fund charges amounting to £7503, to pay off £822 capital expended out of revenue, and to place £282 to the credit of renewals fund, after having spent £628 on renewals during the year. The quantity of gas sold showed a decrease of only 0·8 p.ct. compared with the previous year. The total number of gas consumers was 3026, which was an increase of 103 during the year. There had been fixed during the year 124 additional gas cookers and over 50 gas fires and wash-boilers.

WORKINGTON.

The gas produced during the year amounted to 181,559,000 c.ft. (780,704 therms), a slight increase of 0·38 p.ct. over the previous year. The gas produced per ton of coal carbonized was 20,526 c.ft., equivalent to 88·3 therms; the gas sold per ton of coal carbonized being 19,256 c.ft., or 82·8 therms. The financial results for the year show a net profit of £1151, against a net profit of £843 for the preceding year. The length of mains has been increased during the year by 4·7 miles, which includes the new mains to supply Seaton and Stainburn. The following new gas appliances have been supplied from the Distribution Department during the year: Cookers, 177; gas fires and radiators, 89; gas wash-boilers, 58; miscellaneous gas appliances, 356. The number of prepayment meter fittings installations carried out amounted to 598. Of the total gas registered by meters, 44·44 p.ct. was supplied through ordinary meters, and 55·56 p.ct. through prepayment meters. The average annual consumption per ordinary meter was 36,451 c.ft., and the average per prepayment meter 17,772 c.ft.

GAS MARKETS & MANUFACTURES

Stock Market Report.

[For Stock and Share List, see later page.]

On the resumption of business last week the uncertainty still existed as to the outcome of the debt negotiations between France and the United States, and while prices remained firm there was a hesitancy to enter into fresh commitments. When, however, the news was received on Tuesday of the agreement between the two countries markets showed a brighter tendency, but this was almost immediately negatived by the German and Central European financial crisis. Business therefore slackened off, and the prospects for the coming week do not appear very promising.

Gas stocks and shares remained entirely undisturbed by any outside influences and prices continued very steady. Several more improvements in value were recorded, the most important being those of Newcastle £1 units (at the local Exchange) by 9d. to 16s. 6d.-17s. 6d., Uxbridge 5 p.ct. preference by 2 points to 90-95, and Gas Light £1 units by 3d. to 19s. 3d.-20s. 3d.

As an illustration of the marked improvement shown by gas securities during recent months, the following tables show the current average market prices of the ordinary and irredeemable debenture stocks of some of the larger undertakings compared with those ruling for the corresponding week a year ago:

Ordinary Stocks.

—	Dividend, 1930.	Price.		Increase over 1930.
		1930.	1931.	
Aldershot	5	75½	80½	5
Alliance and Dublin	7⅜	94½	104½	10
Bristol	5	89⅜	96	6½
Commercial	6	91½	95½	4
Croydon sliding scale	7	106½	110½	4
Gas Light £1 units	5½	19s. 3d.	19s. 9d.	6d.
Newcastle £1 units	5¾	16s. 4½d.	17s.	7½d.
Portsmouth	8	112½	124½	12
South Metropolitan	6½	103	104½	1½
South Suburban	6½	102½	104½	2
Southampton	5	77½	79½	2
Tottenham	6⅜	104	105	1
Uxbridge	7	96½	104½	8
Wandsworth	7	107½	112½	5

Debenture Stocks.

—	Interest. P.Ct.	Price.		Increase over 1930.
		1930.	1931.	
Alliance and Dublin	4	61½	74½	13
Commercial	3	57½	60½	3
Gas Light	3	59½	65½	6
South Metropolitan	3	58⅜	64½	6
South Suburban	5	94½	101½	7
Southampton	4	72½	78½	6
Tottenham	4	74½	79½	5
Wandsworth	5	94½	102½	8

A further addition has been made to the Stock and Share List by the inclusion of the Liverpool Gas Company's 4 p.ct. debenture stock. The present amount outstanding is £306,083, and the current price on the Liverpool Exchange is 81, at which price the yield is nearly 5 p.ct. Interest is payable on Jan. 15 and July 15.

The Directors of the Bristol Gas Company have announced an interim dividend of 5 p.ct. per annum, less income-tax, on the Company's 5 p.ct. maximum stock.

Current Sales of Gas Products.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *July* 13.

The prices of tar products to-day are as follows:

Pitch is firm at 50s. per ton f.o.b.

Creosote for export varies from 4d. to 5d. per gallon f.o.b., according to specification.

Pure toluole, 1s. 11d. to 2s. per gallon; pure benzole, 1s. 5d. to 1s. 6d. per gallon; 95/160 solvent naphtha, 1s. 4d. to 1s. 5d. per gallon in bulk *ex* sellers' works.

Pyridine bases, about 3s. 3d. per gallon.

Tar Products in the Provinces.

July 13.

The average prices of gas-works products during the week were: Gas-works tar, 17s. 6d. to 21s. 6d. Pitch—East Coast, 47s. to 47s. 6d. f.o.b. West Coast—Manchester, Liverpool, Clyde, 47s. to 47s. 6d. f.o.b.* Toluole, naked, North, 1s. 7½d. to 1s. 7⅝d. Coal-tar crude naphtha, in bulk, North, 5⅝d. to 6¼d. Solvent naphtha, naked, North, 1s. 3d. to 1s. 3½d. Heavy naphtha, North, 11d. to 1s. Creosote, in bulk, North, liquid and salty, 3d. to 3¼d.; low gravity, 1¼d.; Scotland, 3d. to 3¼d. Heavy oils, in bulk, North, 5⅝d. to 5¾d. Carbolic acid, 60's, 1s. 1d. to 1s. 2d. Naphthalene, £10 to £12. Salts, £3 to £5, bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

* All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port, it will be necessary to deduct the loading costs and the tolls whatever they may be.

Tar Products in Scotland.

GLASGOW, *July* 11.

Conditions show little or no alteration during the week. Pitch for forward delivery is being "talked up," but sales are disappointing.

Pitch.—Export value may be taken at 40s. per ton f.o.b. Glasgow, with forward indications slightly higher. Home trade remains dull at 35s. to 37s. 6d. per ton *ex* works in bulk.

Refined tar to Ministry of Transport Specification is in good demand, with quotations higher at 2½d. to 2¾d. per gallon naked at makers' works.

Creosote.—Best qualities continue scarce and prices are steady. B.E.S.A. Specification is 2¾d. to 3d. per gallon; low gravity, 3½d. to 3¾d. per gallon; and neutral oil, 3¼d. to 3½d. per gallon—f.o.r. in bulk.

Cresylic.—Few orders are being placed, but quotations are unaltered. Pale, 97/99 p.ct. is 1s. 3d. to 1s. 4d. per gallon; dark, 97/99 p.ct., 1s. 2d. to 1s. 3d. per gallon; and pale, 99/100 p.ct., 1s. 5d. to 1s. 6d. per gallon—all *ex* works.

Crude naphtha.—Price is steady at 4¼d. to 4¾d. per gallon in bulk.

Solvent naphtha.—Orders are scarce; 90/160 grade is 1s. 3d. to 1s. 4d. per gallon, and 90/190 grade about 1s. 1d. per gallon.

Motor benzole.—Makers continue to quote 1s. 3d. to 1s. 4d. per gallon f.o.r. in buyers' rail tanks.

Pyridines.—90/160 grade is 3s. to 3s. 3d. per gallon; and 90/140, 3s. 6d. per gallon.

Benzole Prices.

These are considered to be the market prices for benzole:

	s. d.		s. d.	
Crude benzole	0 6½	to	0 7½	per gallon at works
Motor ,,	1 1	,,	1 2	,, ,, ,,
Pure ,,	1 5	,,	1 6	,, ,, ,,

Contracts Advertised To-Day.

Coal.

The Newtown and Llanllwchaiarn Urban District Council invite tenders for the supply of gas coal. [Advert. on p. 166.]

Gasholder.

The Stretford and District Gas Board invite tenders for the reconstruction of a gasholder. [Advert. on p. 166.]

The Skipton Urban District Council invite tenders for the construction of a high-pressure gasholder. [Advert. on p. 166.]

Boosting Plant.

The Edinburgh Corporation Gas Department invite tenders for the supply and fixing of a boosting plant. [Advert. on p. 166.]

Foundations and Reinforced Concrete Work.

The Oldham Gas-Works Committee invite tenders for piled foundation and reinforced concrete work. [Advert. on p. 166.]

STOCK AND SHARE LIST.

[For Stock Market Report, see earlier pages.]

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf. Yr.	Dividends. Last Hf. Yr.	NAME.	Quotations. July 10.	Rise or Fall on Week.	Transactions. Lowest and Highest Prices During the Week.
£			% p.a.	% p.a.				
171,978	Stk.	Feb. 5	5	5	Aldershot 5 p.c. max. C. ...	78—83	...	...
522,992	"	"	4	4	Do. 4 p.c. Pref. ...	75—80	...	78½
1,551,868	"	Apl. 9	7⅞	7⅞	Alliance & Dublin Ord. ...	102—107	...	105—106
374,000	"	July 9	4	4	Do. 4 p.c. Deb. ...	71—76*	−1	...
522,655	"	Mar. 5	7	7	Barnet Ord. 7 p.c.	124—129	...	...
300,000	1	Apl. 23	1/4⅛	1/9⅜	Bombay, Ltd.	16/6—18/6	...	...
174,500	10	Mar. 5	9	9	Bournemouth 5 p.c. ...	15—16	...	...
500,050	10	"	7	7	Do. B 7 p.c. ...	12⅝—13½	...	13—13½
439,160	10	"	6	6	Do. Pref. 6 p.c. ...	11½—11⅝	...	..
50,000	Stk.	June 25	3	3	Do. 3 p.c. Deb. ...	60—63	...	...
162,025	"	"	4	4	Do. 4 p.c. Deb. ...	80—83	...	...
357,900	"	Mar. 19	7½	7½	Brighton & Hove 6 p.c. Con.	112—117	...	...
371,880	"	"	6⅜	6⅜	Do. 5 p.c. Con.	105—108	...	...
1,287,500	"	Feb. 19	5	5	Bristol 5 p.c. max.	95½—96½a	...	...
120,420	"	June 25	4	4	Do. 1st 4 p.c. Deb. ...	78—80a	+1	...
217,870	"	"	4	4	Do. 2nd 4 p.c. Deb. ...	78—80a	+1	...
328,790	"	"	5	5	Do. 5 p.c. Deb.	98—99a	...	...
855,000	"	Apl. 9	7	8	British Ord.	110—115	...	113½—114½
100,000	"	June 25	7	7	Do. 7 p.c. Pref.	110—115	...	...
120,000	"	"	4	4	Do. 4 p.c. Red. Deb. ...	77—80	...	...
450,000	"	"	5	5	Do. 5 p.c. Red. Deb. ...	97—100	...	...
160,000	"	June 25	5	5	Cambridge 5 p.c. Deb. ...	98—101	...	...
100,000	10	May 21	6	8	Cape Town, Ltd.	9—10	...	...
100,000	10	May 7	4½	4½	Do. 4½ p.c. Pref. ...	6⅞—7½	...	...
150,000	Stk.	June 25	4½	4½	Do. 4½ p.c. Deb. ...	72—77	...	...
628,860	"	Feb. 19	6	6	Cardiff Con. Ord.	97—100	...	99½
237,860	"	June 25	7½	7½	Do. 7½ p.c. Red. Deb. ...	97—100	...	...
157,150	"	Feb. 19	5	6⅛	Chester 5 p.c. Ord.	85—90b	...	..
98,936	1	May 7	†2/-	†2/-	Colombo, Ltd. Ord.... ...	28/—33/-	...	...
24,500	1	"	1/4⅛	1/4⅛	Do. 7 p.c. Pref.	17/6—19/6	...	...
609,204	1	Apl. 9	1/4⅛	15·27d	Colonial Gas Assn. Ltd. Ord.	16/—18/-	...	...
296,053	1	"	1/7½	17·67d	Do. 8 p.c. Pref.	17/6—19/6	...	...
2,073,280	Stk.	Feb. 19	6	6	Commercial Ord.	94—97	...	95½
475,000	"	June 11	3	3	Do. 3 p.c. Deb. ...	59—62	...	...
787,560	"	Feb. 19	7	7	Croydon sliding scale ...	109—112	...	111—111½
453,100	"	"	5	5	Do. max. div.	82—85	...	...
542,270	"	Mar. 5	7	10	Derby Con.	122—125e	...	...
55,000	"	June 25	4	4	Do. Deb.	65—70e	...	...
209,000	"	Mar. 5	5	5	East Hull Ord. 5 p.c. ...	72—75	...	...
1,002,180	"	Mar. 19	†4	†6½	European, Ltd.	85—95	...	85—92½
18,953,033	"	Feb. 19	5⅜	5⅜	Gas Light & Coke 4 p.c. Ord.	19/3—20/3f	+·/3	19/7½—20/1½
2,600,000	"	"	3½	3½	Do. 3½ p.c. max.	66—69	+1	67—68
4,294,691	"	"	4	4	Do. 4 p.c. Con. Pref. ...	80—83	...	81—82
5,694,095	"	June 11	3	3	Do. 3 p.c. Con. Deb. ...	64—67	+1	64½—66
3,642,770	"	"	5	5	Do. 5 p.c. Red. Deb. ...	101—104	...	102½
2,500,000	"	"	—	—	Do. 4½ p.c. Red. Deb. ...	97—100	...	98½—99½
161,480	"	Mar. 5	10	10	Harrogate Cons. 10 p.c. max.	157—162	...	...
82,500	"	Mar. 19	7	7	Hastings & St. L. 5 p.c. Conv.	98—103	...	...
258,740	"	"	5½	5½	Do. 3½ p.c. Conv.	82—85	...	84
70,000	10	Oct. 9	§	10	Hongkong & China, Ltd. ...	13—14	...	...
213,200	Stk.	Mar. 5	6	6	Hornsey Con. 3½ p.c. ...	91—94	...	...
2,800,000	"	May 21	15	25	Imperial Continental Cap.	330—350	...	335—347
323,130	"	Feb. 5	3½	3½	Do. 3½ p.c. Red. Deb.	78—83	...	...
235,242	"	Mar. 5	8½	8½	Lea Bridge 5 p.c. Ord. ...	127—130	...	...
2,145,907	"	Feb. 19	6	6	Liverpool 5 p.c. Ord. ...	99⅜—100½b	...	...
306,083	"	Jan. 15	4	4	Do. 4 p.c. Deb. ...	80—82b	...	...
165,736	"	Feb. 19	9	9	Maidstone 5 p.c. Cap. ...	128—133	...	...
63,480	"	June 25	3	3	Do. 3 p.c. Deb. ...	57—60	...	...
75,000	5	June 11	†10	†10	Malta & Mediterranean ... Metropolitan (of Melbourne) 5½ p.c. Red. Deb.	6—6⅛	...	...
392,000	—	Apl. 2	5½	5½		86—89	...	
675,000	Stk.	May 21	†6	†6	Montevideo, Ltd.	80—90	−5	80
2,061,315	"	Mar. 5	5	5½	Newcastle & Gateshead Con.	16/6—17/6d/	+·/9	...
682,856	"	"	4	4	Do. 4 p.c. Pref. ...	7⅛—7⅜d	+1	...
691,705	"	Jan. 8	3½	3½	Do. 3½ p.c. Deb. ...	68⅛—69⅛d	...	...
277,285	"	May 7	5	5	Do. 5 p.c. Red. Deb.	98—100d	...	...
199,940	"	Mar. 5	7½	7½	North Middlesex 6 p.c. Con.	115—120	...	...
396,160	"	Feb. 5	5	5	Northampton 5 p.c. max. ...	74—79	...	...
300,000	"	Apl. 23	9	7	Oriental, Ltd.	98—103	...	99
60,000	5	13 May, '15	—	—	Ottoman	0—½	...	...
205,162	Stk.	June 25	8	8	Plym'th & Stonehouse 5 p.c.	110—115	...	...
424,416	"	Feb. 19	8	8	Portsm'th Con.Stk. 4 p.c.Std.	122—127	...	...
241,446	"	"	5	5	Do. 5 p.c. max.	78—81	...	...
686,312	"	Jan. 22	4	4	Primitiva 4 p.c. Rd. Db. 1911	85—88	...	...
389,813	"	June 25	4	4	Do. 4 p.c. Cons. Deb.	84—87	...	...
150,000	10	Apl. 9	6	6	San Paulo 6 p.c. Pref. ...	8—8½	...	...
1,736,968	Stk.	Mar. 19	6⅝	6⅝	Sheffield Cons.	105—107e	...	...
95,000	"	July 9	4	4	Do. 4 p.c. Deb.	79—81e	...	...
90,000	10	June 11	†5	†5	South African	3½—5½	...	...
6,709,895	Stk.	Feb. 5	5	7½	South Met. Ord.	103½—105½	...	103½—105
1,135,812	"	"	6	6	Do. 6 p.c. Irred. Pf.	113—116	...	116
1,895,445	"	July 9	3	3	Do. 3 p.c. Deb. ...	62—65*	−1	65⅝
734,000	"	Mar. 5	6⅛	6⅛	Do. 6⅛ p.c. Red. Db.	98—100	...	...
1,009,000	"	Jan. 22	—	4	Do. 5 p.c. Red. Deb.	101—104	...	102—103⅜
91,500	"	Mar. 5	8½	8½	South Shields Con.	113—115d	−1	...
1,543,795	"	Feb. 19	6⅜	6⅜	South Suburban Ord. 5 p.c.	103—106	..	104½—105½
668,837	"	June 25	5	5	Do. 5 p.c. Deb.	100—103	...	...
647,740	"	Feb. 19	5	5	Southampt'n Ord. 5 p.c. max.	78—81	...	...
121,275	"	June 25	4	4	Do. 4 p.c. Deb.	77—80	...	...
179,014	"	Mar. 5	8	8	Sutton Ord.	120—130	...	...
94,500	"	June 25	5	5	Do. 5 p.c. Deb.	96—99	...	...
250,000	"	Mar. 5	7	7	Swansea 7 p.c. Red. Pref. ...	98—101	...	...
200,000	"	June 25	6½	6½	Do. 6½ p.c. Red. Deb.	99—102	...	...
1,076,490	"	Mar. 5	6⅜	6⅜	Tottenham District Ord. ...	103—107	...	106½
150,000	"	"	5½	5½	Do. 5½ p.c. Pref. ...	101—104	...	...
199,005	"	June 11	4	4	Do. 4 p.c. Deb. ...	78—81	...	...
85,701	"	Mar. 19	6	6	Tuscan, Ltd., 6 p.c. Red. Db.	74—79	...	...
310,694	"	Mar. 5	7	7	Uxbridge, Maidenhead, & Wycombe 5 p.c.	102—107	...	...
88,330	"	"	5	5	Do. 5 p.c. Pref. ...	90—95	+2	...
1,322,220	"	July 9	7	7	Wandsworth, Wimbledon, and Epsom Cons. ...	111—114*	−2	...
426,000	"	"	5	5	Do. 5 p.c. Pref.	95—98*	−2	...
1,013,464	"	June 25	5	5	Do. 5 p.c. Deb.	101—104	...	...

Quotations at:—*a.*—Bristol. *b.*—Liverpool. *c.*—Nottingham. *d.*—Newcastle. *e.*—Sheffield. *f.*—The quotation is per £1 of stock. * Ex. div. † Paid free of income-tax. ‡ For year. § Div. = 10 p.ct. p.a. less tax and less tax on interim dividend.

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THE SECRET OF A CHEAP & ABUNDANT SUPPLY of HOT WATER

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MINIMUM GAS CONSUMPTION
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NO DISCOLORATION OF WATER
NO CORROSION OF INTERNAL FLUES
NO CONDENSATION
NO DEPOSITS IN FLUES OR BOILER
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Guide Bridge Manchester

INDEX TO "JOURNAL" ADVERTISERS.

	PAGE
Aerograph Co., Ltd.	—
Alder & Mackay, Ltd. Wrapper I.,	127, 135
Allan, Thomas, & Sons, Ltd.	—
Anglo-American Oil Company, Ltd.	—
Arden Hill & Co.	—
Asbestos Cement Building Products, Ltd.	—
Ashmore, Benson, Pease, & Co., Ltd.	Wrapper I.
Avery, W. & T., Ltd.	—
Bagnall, John, & Sons, Ltd.	—
Bagshawe & Co., Ltd.	—
Bale & Church, Ltd.	165
Barclay, Andrew, Sons, & Co., Ltd.	172
Barrowfield Ironworks, Ltd.	—
Bell's Poilite & Everite Co., Ltd.	—
Berk, F. W., & Co., Ltd.	—
Birtley Co., Ltd.	—
Blakeley Firth, Sons, & Co., Ltd.	166
Braddock, J. & J.	Centre VIII., 165
Bradley & Burch, Ltd.	—
Bray, George, & Co., Ltd.	—
British Aluminium Co., Ltd.	—
British Engine Boiler and Electrical Insurance Co., Ltd.	—
British Fibrocement Works, Ltd.	—
British Furnaces, Ltd.	173
British Gas Purifying Materials Co.	165
British Industries Fair	—
British Thomson-Houston Co., Ltd.	173
Broadbent, Thos., & Son, Ltd.	—
Broadhead Constructions, Ltd.	—
Bugden, T., & Co.	171
Cambridge Instrument Co., Ltd.	139
Cannon Iron Foundries, Ltd.	Centre X.
Carron Company	—
Cellactite & British Uralite, Ltd.	—
Chapman (Spencer) & Messel, Ltd.	165
Chemical Engineering and Wilton's Patent Furnace Co., Ltd.	136
Clapham Bros., Ltd.	—
Clarks Stove Co., Ltd.	—
Clayton, Son, & Co., Ltd.	175
Cloake, A. G.	Centre VII.
Cort, Robert, & Son, Ltd.	130
Cowan, W. & B.	Wrapper III.
Crossley Bros. (Bispham)	—
Cutler, Samuel, & Sons, Ltd.	Centre XI.
Dampney, J., & Co., Ltd.	—
Davis Gas Stove Co., Ltd.	133
Davison & Partner, Ltd.	—
Dempster, R. & J., Ltd.	Wrapper I.
Dempster, R., & Sons, Ltd.	Centre II., 166
Donkin Co., Ltd. (The Bryan)	Wrapper II.
Drakes, Ltd.	—
Drayton Regulator and Instrument Co., Ltd.	—
Dry Gasholders, Ltd.	—
Duckham, Alexander, & Co., Ltd.	—
Duxbury, Thomas, & Co.	Wrapper I., 165
E. B. Refractory Cement Co., Ltd.	—
Economic Gas Boiler Co., Ltd.	—
Economical Gas Apparatus Construction Company, Ltd.	—
Eden Fisher & Co., Ltd.	—
Electrolux, Ltd.	131
Evans, Joseph, & Son (Wolverhampton), Ltd.	172
Expanded Metal Company, Ltd.	—
Falk, Stadelmann, & Co., Ltd.	—
Fletcher, Russell, & Co., Ltd.	—
Foster & Pullen, Ltd.	—
Foster Bros., Ltd.	—
Fraser & Chalmers Engineering Works	132
Gas Chambers and Coke Ovens, Ltd.	—
Gas Meter Co., Ltd.	Wrapper IV., 134
Gas Purification and Chemical Co.	Wrapper I., 165
General Gas Appliances, Ltd.	163
General Refractories, Ltd.	—
Gent & Co., Ltd.	128
Gibbons Bros., Ltd.	129
Gibbons (Dudley), Ltd.	—
Gledhill-Brook Time Recorders	172
Glenboig Union Fireclay Co., Ltd.	169
Glover, George, & Co., Ltd.	125
Glover, Thos., & Co., Ltd.	140
Goodall, Clayton, & Co., Ltd.	Centre VII.
Grant, David, & Co.	174
Graphite Products, Ltd.	169
Green & Boulding, Ltd.	166
Griffiths Bros. & Co. (London), Ltd.	Wrapper I.
Hall, John, & Co., Stourbridge, Ltd.	—
Hardtmuth, L. & C.	—
Harris & Pearson	172
Head, Wrightson, & Co., Ltd.	—
Holmes, W. C., & Co., Ltd.	Wrapper I., 167
Holst, K., & Co.	—
Horseley Bridge and Engineering Company, Ltd.	—
Horstmann Gear Company, Ltd.	—
Humphreys & Glasgow, Ltd.	138
Hutchinson Bros., Ltd.	—
India Rubber, Gutta Percha, and Telegraph Works Co., Ltd.	—
Institute of Chemistry	—
Jenkins, Robert, & Co., Ltd.	—
Jenkins, W. J., & Co., Ltd.	137
Keith, James, & Blackman Company, Ltd.	176
Kempton, C. H., & Co., Ltd.	136
King, Walter, Ltd.	170, 172
King's Patent Agency	165
Kirke, P., & Co.	—
Kirkham, Hulett, & Chandler, Ltd.	126
Kleenoff Co.	165
Koppers Coke Oven Co., Ltd.	—
Lacy-Hulbert & Co., Ltd.	—
Laidlaw, R., & Son (Edin.), Ltd.	170
Lancaster Bros. & Co.	160
Le Bas Tube Co., Ltd.	173
Lead Wool Company, Ltd.	171
Lighting Trades Ltd.	—
London Electric Firm, The	—
Lumbys, Ltd.	—
Macpherson, Donald, & Co., Ltd.	—
Main, R. & A., Ltd.	Centre IX.
Manchester Oxide Co., Ltd.	—
McKelvie, James, & Co.	Wrapper I.
Metropolitan Vickers Electrical Co., Ltd.	—
Mewburn, Ellis, & Co.	165
Mitchell, H., & Co.	—
Moore Gas Plant	—
New Conveyor Co., Ltd.	176
Newton Chambers & Co., Ltd.	Centre VI.
Non-Rust Liquid Lead Co., Ltd.	—
Orme, George, & Co.	—
Oughtibridge Silica Firebrick Co.	127
Parkinson Stove Co., Ltd.	Centre III.
Parkinson, W., & Co.	128, 140
Patent Retorts, Ltd.	128
Pearn, Frank, & Co., Ltd.	—
Pearson, E. J. & J., Ltd.	—
Peckett & Sons, Ltd.	128
Peebles & Co., Ltd.	—
Perfecta Meters, Ltd.	—
Phillips, J. W. & C. J., Ltd.	166
Pickles, Ayland, & Co., Ltd.	172
Piggott, Thos., & Co., Ltd.	—
Pneumatic Conveyance and Extraction (1929), Ltd.	—
Potterton, T. (Heating Engineers), Ltd.	—
Progas Co., Ltd.	—
Pulsometer Engineering Company	Wrapper IV.
Purimachos Ltd.	171
Radiation Ltd.	Centre IV., V., 133
Raschig, Dr. F., G.m.b.H.	—
Reavell & Co., Ltd.	168
Richmonds Gas Stove Co., Ltd.	—
Rigby, John, & Sons, Ltd.	—
Riley, John, & Sons, Ltd.	—
Robinson, J. H., & Co. (L'pool), Ltd.	—
Ross, Chas., Ltd.	165
Rotary Meter Company, Ltd.	—
Rotherham and District Collieries Association, Ltd.	Wrapper IV.
Rotherham & Sons, Ltd.	169
Ruscoe, John, & Co., Ltd.	172
Sawer & Purves	—
Schuringa, T.	—
Scottish Tube Co., Ltd.	175
Sheepbridge Coal and Iron Co., Ltd.	Wrapper IV.
Siebe, Gorman, & Co., Ltd.	171
Simon-Carves, Ltd.	—
Smith Meters, Ltd.	—
Solent Engineering Co., Ltd.	—
South Metropolitan Gas Company	Wrapper II.
Spencer-Bonecourt, Ltd.	135
Spencer Chapman & Messel, Ltd.	165
Stanton Ironworks Co., Ltd.	Centre XI.
Staveley Coal and Iron Co., Ltd.	—
Stein, J. G., & Co., Ltd.	Wrapper I.
Stewarts and Lloyds, Ltd.	174
Stothert & Pitt, Ltd.	—
Stoves, Ltd.	—
Strachan & Henshaw, Ltd.	125
Stringer Bros.	—
Sugg, Wm., & Co., Ltd.	—
Taylor, Joseph (Saturators), Ltd.	—
Thomas & Bishop, Ltd.	—
Thompson, J. (Wolverhampton), Ltd.	—
Tilley Bros., Ltd.	—
Torbay Paint Company, Ltd.	Wrapper I.
Trier Bros., Ltd.	—
Trotter, Haines, and Corbett, Ltd.	166
Tully Sons & Co., Ltd.	174
Turbine Furnace Co., Ltd.	—
Turner Brothers Asbestos Co., Ltd.	—
Turner, F. (Art Metal), Ltd.	171
Vertical Gas Retort Synd., Ltd.	171
Vickery, James H., & Co., Ltd.	135
Vulcan Stove Co., Ltd.	—
Wailes Dove Bitumastic, Ltd.	132
Walker, C. & W., Ltd.	Centre VII.
Walker, Crosweller, & Co., Ltd.	—
Waller, Geo., & Son, Ltd.	126
Walworth, Ltd.	—
Waterless Gasholder Co., Ltd.	—
Weir, G. & J., Ltd.	—
Wellington Tube Works, Ltd.	—
Welsbach Light Company, Ltd.	—
West's Gas Improvement Co.	Centre XII.
Westwood & Wrights, Ltd.	—
Whessoe Foundry and Eng. Co., Ltd.	—
Willey & Co., Ltd.	Centre VIII.
Williamson Cliff, Ltd.	—
Wilson (George) Gas Meters, Ltd.	165
Wilsons & Mathiesons, Ltd.	—
Winn, Paul, & Co., Ltd.	—
Woodall-Duckham Co., Ltd.	Centre I.
Woolley, James, Sons, & Co., Ltd.	—
Worthington-Simpson, Ltd.	—
Wright, Alex., & Co., Ltd.	Wrapper I.
Wright, John, & Co.	—

Appointments Vacant and Wanted	165
Books for Sale	—
Company Notices	—
Contracts Open	166
Educational	—
Patent Licence	—
Plant, &c., for Sale and Wanted	165, 166
Stock Issues	166

CONTENTS

EDITORIAL NOTES.

A GLANCE AT THE CONTENTS . . . 195
Alloa . . . 196
A Useful Process . . . 196
A Memorable Jubilee . . . 197
Gas for Street Lighting . . . 197
Bournemouth Rating Appeal . . . 198

Forthcoming Engagements . . . 198
Personal . . . 198

CORRESPONDENCE.

The Late Mr. Seymour Tobey . . . 198
"C.O.L." Intermittent Vertical Chambers at Flathouse (Portsmouth) . . . 198

NEWS OF THE WEEK.

Paragraphs . . . 201
Glasgow Gas Department Win Silver Medal for Stand at Exhibition . . . 202
Gas Refrigerator Campaign at Neath . . . 202
Model All-Gas Flat at Plymouth . . . 202
Institution of Gas Engineers' Examinations, 1931—Report of the Board of Examiners . 203
Education and Examinations . . . 203
Irish Association of Gas Managers—A Full Programme for the Annual Meeting . . 203
The Parkinson Stove Company, Ltd. . . . 204
Parkinson & Cowan, Ltd. . . . 204

NEWS OF THE WEEK—*(continued)*.

Society of Chemical Industry—Jubilee Meeting and Dinner . . . 204
South Suburban Co-Partnership Festival—Dr. Carpenter's Address at the Crystal Palace . . . 205
Gas Light and Coke Company's Dividend . 205

SPECIAL ARTICLES, &c.

Institution of Gas Engineers—Results of 1931 Examinations . . . 199
Gas Service—Discussed from the Viewpoint of the Gas Salesman . . . 201
Reviews . . . 205
Gasholder Repair while at Work . . . 206
Continental Notes . . . 208
Rhyl's New Verticals . . . 209
British Chemical Plant Exhibition . . . 210
Gas-Works Extensions at Bollington . . . 211

"JOURNAL" TECHNICAL RECORD.

Manchester District Institution of Gas Engineers—
Dilution of Straight Coal by Producer Gas Externally Generated. By Alfred L. Holton . . . 213
Dilution of Straight Coal Gas by Steaming in Intermittent Chamber Ovens. By G. Dixon, B.Eng., Assoc.M.Inst.C.E. . . . 215
Society of Chemical Industry—Discussion on Fuel Subjects . . . 216

REGISTER OF PATENTS.

Bread Baking Ovens—South Metropolitan Gas Company and Chandler, D. . . . 219
Rubber Tubing—The Gas Light and Coke Company, Clark, J. G., and Masterman, C. A. . . . 219

LEGAL INTELLIGENCE.

Alloa Income-Tax Case—Adverse Decision of Scottish Court of Session . . . 220

MISCELLANEOUS.

Parliamentary Intelligence . . . 220
Corporation Undertakings' Results for 1930-31 221
Trade Notes . . . 222
Gas Acts (1920 and 1929) Orders . . . 222

GAS MARKETS AND MANUFACTURES.

Stock Market Report . . . 222
Current Sales of Gas Products . . . 222
Contracts Advertised To-Day . . . 222

Stock and Share List . . . 223

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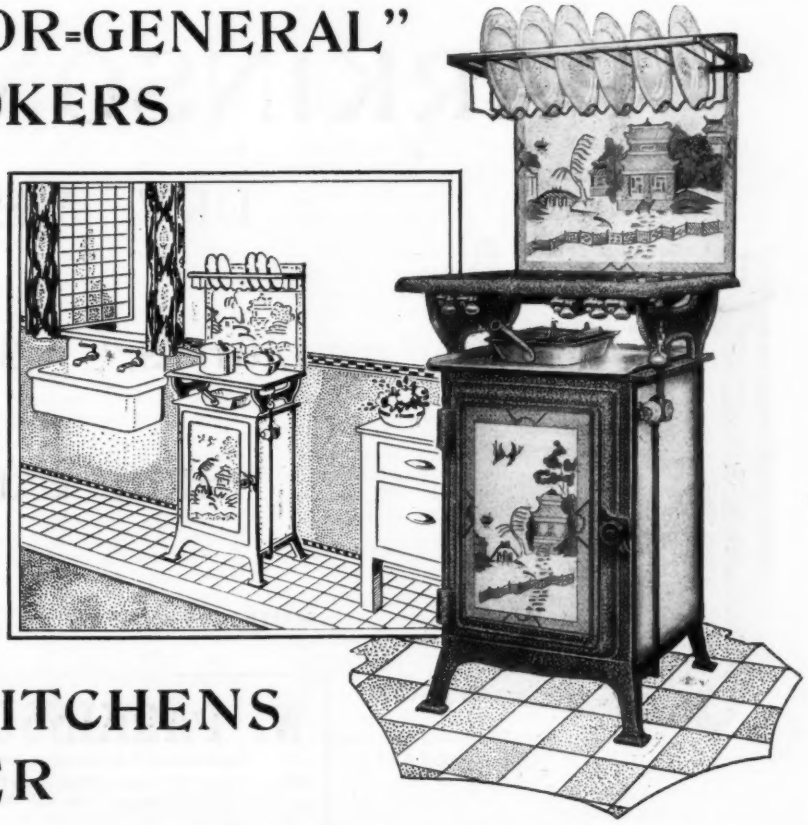

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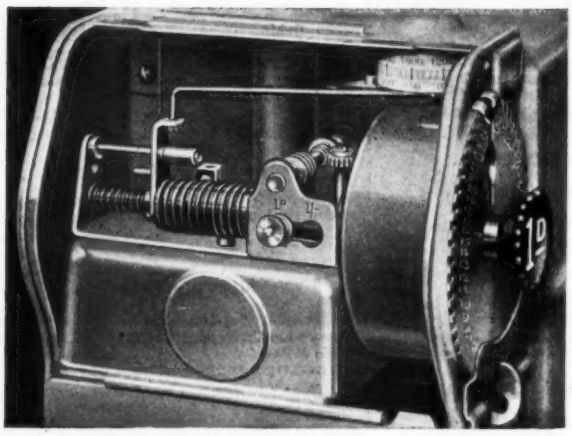

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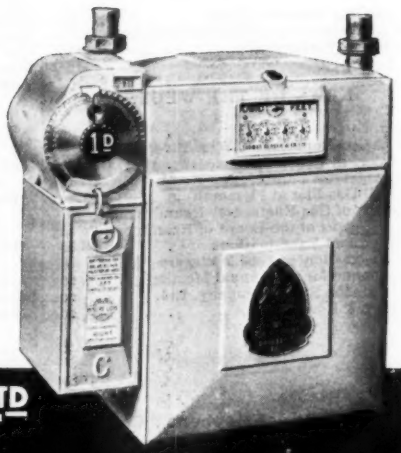

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